ABSTRACT

OF

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An Abstract of the Proceedings

OF THE

Association of Life Insurance Medical Directors of America

FORTY-FIRST ANNUAL MEETING

The Forty-First Annual Meeting of the Association of Life Insurance Medical Directors of America was held at the Home Office of the Metropolitan Life Insurance Company, New York City, on October 23 and 24, 1930. The Association was the guest of the Metropolitan Life Insurance Company. President William Muhlberg was in the chair.

The following members, delegates and guests were present at some time during the sessions: Drs. C. D. Alton, H. H. Amiral, H. B. Anderson, T. D. Archibald, A. E. Awde, H. A. Baker, W. B. Bartlett, J. T. J. Battle, W. W. Beckett, M. B. Bender, S. R. Benedict, N. R. Blatherwick, C. C. Birchard, W. F. Blackford, Wm. Bolt, J. T. Bowman, W. M. Bradshaw, F. G. Brathwaite, J. L. Brooks, C. T. Brown, B. F. Byrd, E. J. Campbell, F. H. Carber, H. R. Carstens, L. D. Chapin, J. P. Chapman, C. L. Christiernin, C. P. Clark, E. A. Colton, H. W. Cook, P. M. Cort, D. B. Cragin, H. C. Cruikshank, George Cullen, R. M. Daley, H. D. Delamere, E. J. Dewees, E. G. Dewis, H. W. Dingman, J. H. Dunkley, E. W. Dwight, O. M. Eakins, F. C. Evers, W. G. Exton, H. H. Fellows, R. M. Filson, J. W. Fisher, Paul FitzGerald, Otto Folin, R. A. Fraser, H. M. Frost, W. S. Gardner, R. J. Graves, F. L. Grosvenor, Llewellyn

Hall, Frank Harnden, J. D. Heacock, C. A. Heiken, E. M. Henderson, W. L. Hilliard, D. W. Hoare, J. C. Horan, Ross Huston, W. G. Hutchinson, C. B. Irwin, W. A. Jaquith, B. Y. Jaudon, F. L. B. Jenney, A. O. Jimenis, A. E. Johann, F. W. Kenney, A. S. Knight, C. N. McCloud, C. P. McCord, F. H. McCrudden, C. B. McCulloch, A. A. MacDonald, A. J. McGanity, L. F. MacKenzie, W. T. McNaughton, F. W. McSorley, H. L. Mann, O. F. Maxon, J. T. Montgomery, R. C. Montgomery, Wm. Muhlberg, Herbert Old, M. I. Olsen, G. P. Paul, J. S. Phelps, C. B. Piper, J. E. Pollard, J. J. Post, W. W. Quinlan, W. A. Reiter, F. P. Righter, J. A. Roberts, A. J. Robinson, T. H. Rockwell, O. H. Rogers, H. B. Rollins, E. K. Root, A. R. Rose, R. L. Rowley, S. C. Rumford, E. F. Russell, H. C. Scadding, C. E. Schilling, S. B. Scholz, Jr., E. M. Shepherd, A. L. Sherrill, R. L. Shields, R. R. Simmons, J. L. Siner, Dewitt Smith, J. M. Smith, W. B. Smith, Morton Snow, S. C. Stanton, H. F. Starr, J. B. Steele, D. F. Steuart, L. G. Sykes, B. C. Syverson, W. E. Thornton, Wallace Troup, F. L. Truitt, H. E. Ungerleider, C. A. Van Dervoort, Euen Van Kleeck, R. C. Voss, W. R. Ward, F. S. Weisse, P. V. Wells, S. S. Werth, C. D. Wheeler, C. F. S. Whitney, T. H. Willard, Gordon Wilson, G. E. Woodford, L. S. Ylvisaker, H. H. Young, and Messrs. R. E. Chambers, Arthur Hunter, and A. H. Koeppe.

Total attendance at all sessions, 145.

The following persons were admitted to membership:

Dr. Benjamin F. Byrd, The National Life & Accident Insurance Company, Inc., Nashville, Tenn.

Dr. Harold D. Delamere, Crown Life Insurance Company, Toronto, Ont., Canada.

Dr. Clifton R. Dudley, Continental Life Insurance Company, St. Louis, Mo.

Dr. James H. Dunkley, The Shenandoah Life Insurance Company, Roanoke, Va.

Dr. Llewellyn Hall, Phoenix Mutual Life Insurance Company, Hartford, Conn.

Dr. F. Tulley Hallam, The State Life Insurance Company, Indianapolis, Ind.

Dr. Walter C. Hausheer, Prudential Insurance Company, Newark, N. J.

Dr. Arthur J. McGanity, Dominion Life Assurance Company of Canada, Waterloo, Ont., Canada.

Dr. John F. Moore, Jr., Mutual Life Insurance Company, New York City.

Dr. George S. Reynolds, Berkshire Life Insurance Company, Pittsfield, Mass.

Dr. Paul V. Reinartz, Prudential Insurance Company, Newark, N. J.

Dr. Ralph R. Simmons, Equitable Life Insurance Company of Iowa, Des Moines, Iowa.

Dr. David F. Steuart, Mutual Benefit Life Insurance Company, Newark, N. J.

Dr. I. Read Stidger, Prudential Insurance Company, Newark, N. J.

Dr. Harold F. Taylor, Aetna Life Insurance Company, Hartford, Conn.

Dr. Harry E. Ungerleider, The Equitable Life Assurance Society, New York City.

DR. MUHLBERG—During the past year, two of our members have passed from us and colleagues of the Association have been delegated to draft suitable memorials. These will not be read, but the Secretary will announce the names of the deceased members.

CHARLES DAY BENNETT

Charles Day Bennett, a Medical Director of the Mutual Benefit Life Insurance Company, died on May 11, 1930. Death was due to pneumonia following a fracture of the femur.

Dr. Bennett lived his entire life in and about Newark. In fact a portion of the very ground upon which the former Home Office of the Mutual Benefit was built, was once occupied by

his forebears. He himself was born in Millburn, a nearby suburb, in 1857. He received his preliminary education in Newark schools and in 1875 he entered Princeton College, graduating with honors in the Class of '78. Choosing Medicine as his life vocation, he entered the College of Physicians and Surgeons in New York, graduating in 1881. He then began the practice of medicine in Newark. As a physician, Dr. Bennett attained a large measure of success. He was studious, conscientious, and faithful to the last degree. His patients reposed confidence in his skill, and even after his retirement from private practice many of them sought his advice.

Twenty-five years ago, Dr. Bennett entered the Home Office service of the Mutual Benefit as an Assistant Medical Director. Prior to that time he had given much attention to Life Insurance examinations, so he came to the Company well equipped for his new duties. To this service he devoted the same conscientious care that he had previously given to his private practice. He was firm in his convictions and positive in his opinions, which always commanded respect for they were based upon careful and thorough study and a long clinical experience. The Company recognized Dr. Bennett's sterling qualities and in 1928 he was appointed a Medical Director. Throughout a quarter of a century Dr. Bennett gave to the Mutual Benefit a most faithful and efficient service. Those of us who were in daily contact with him will greatly miss his wholesome and helpful companionship.

Dr. Bennett always recognized in a very large measure his responsibility to the Medical Profession. For many years he was a member of the staffs of the Newark hospitals and rendered a gratuitous service to many needy patients. He was also most devoted to his obligations to the State and County Medical Societies in which he held many positions of trust and responsibility. For many years he assisted in the editing of the Journal of the Medical Society of New Jersey and for thirty years he was the Secretary of the Society for the Relief of Widows and Orphans of Medical Men of New Jersey. He experienced a great satisfaction in this service and his last

communication was a letter, dictated only a few hours before his death, to the members of this organization.

But Dr. Bennett's interests were not confined to his profession. He was a true lover of nature. Plants and flowers were his daily companions. He also found much enjoyment in travel and had an unusual knowledge of geography.

With all of these varied activities, Dr. Bennett also found time for his obligations to his church. He was for many years the President of the Board of Trustees of Calvary Presbyterian Church of Newark.

The world is in need of more men of the type of Charles D. Bennett.

DR. PAUL E. TIEMANN

It is with the deepest regret that I bring to your attention the death on July 13, 1930, of Dr. Paul E. Tiemann, Assistant Medical Director of the New York Life Insurance Company and a member of this Association. Dr. Tiemann was born in New York, April 30, 1860, on the Tiemann Estate, where his grandfather, once Mayor of the City, also lived. This Estate was on the Hudson near what is now Riverside Drive and 127th Street.

After graduating from Columbia University and the College of Physicians and Surgeons and serving an internship in St. Lukes Hospital, Dr. Tiemann spent a year in study abroad—principally in Vienna. He also spent a year in the study of mental diseases at the Hospital for the Insane at Poughkeepsie but did not follow the practice of medicine for any length of time. His connection with the New York Life Insurance Company began in November, 1890. For nearly forty years he was a most efficient member of its medical staff—one whose opinions and open-minded judgments were valued by all of his co-workers.

His life was not a limited one in any sense. He traveled widely, had a large and varied experience and a rare knowledge of men and events. A dependable memory assisted by well

kept records made him a storehouse of interesting and valuable information.

During his lifetime Dr. Tiemann was a member of many prominent medical and social organizations—among these were St. Lukes Alumni Hospital Graduates Club, St. Nicholas Society, Sons of the Revolution and the Order of the Cincinnati.

Many of us in this Association have had the privilege of knowing Dr. Tiemann and all who did feel a deep and personal loss in his passing from our midst.

The following officers and members of the Executive Council were elected for the year 1930-1931:

For President—Dr. Robert L. Rowley.
For First Vice-President—Dr. Charles L. Christiernin.
For Second Vice-President—Dr. Lawrence G. Sykes.
For Secretary—Dr. Chester T. Brown.
For Treasurer—Dr. Albert O. Jimenis.
For Editor of the Proceedings—Dr. Robert A. Fraser.
For Elective Members of the Executive Council—Dr. George A. Van Wagenen, Dr. Edwin W. Dwight, Dr. Morton Snow, Dr. Eugene F. Russell, Dr. Ross Huston.

Dr. Muhlberg—It has been the usual custom in the past to hold our meetings in the home city of the presiding officer, but I felt that if we convened in Cincinnati, it would materially cut down the attendance. I need not assure you that the officers of the Union Central Life Insurance Company would have been only too happy to welcome you at our Home Office and that they were willing to forego this privilege only because they felt it was for the best interests of the Association to meet in New York.

With the magnanimity so characteristic of the Metropolitan Life Insurance Company, Dr. Willard and Dr. Knight extended an invitation to meet in their cozy little workshop and heaped further favors by insisting on acting as hosts to our luncheons.

I am deeply grateful for this courtesy. If our meeting is a successful and enjoyable one, it will be largely due to their generosity.

I have further departed from the usual custom in refraining from delivering a President's Address. In view of the fact that Dr. McCord's paper will deal with research studies of the Cincinnati Heart Council, with which I happen to be associated, and that Mr. Koeppe, our Assistant Actuary, and I will present a paper on "Southern Mortality", I feel that I am already adequately, if not redundantly, represented on the program.

Cardiac Diseases are becoming of increasing importance and concern to Medical Directors. Not only is the death rate from heart disease mounting past the age of 50, but self-selection against the Companies is becoming more manifest, owing to more elaborate and precise methods of diagnosis, of which we can not avail ourselves except in a very limited number of cases. Any practical method that can be introduced into insurance examinations that will help solve this problem will be welcomed, and we should be very grateful to Dr. MacKenzie and Dr. Frost for their earnest and promising researches.—Dr. MacKenzie, of the Prudential.

FLARIMETER TESTS

By L. F. MacKenzie, M. D., P. V. Wells, D. Sc., E. G. Dewis, M. D., L. S. Ylvisaker, M. D.

The Prudential Insurance Company of America, Newark, New Jersey.

Production problems appeared at every stage in the manufacture of the Flarimeter and added experience led to the introduction of improvements in order that the instrument might possess the greatest degree of convenience and accuracy obtainable. Much time was required to effect these improvements. The new model which we are able to present at this time is a distinct advance over the one shown last year to this Association. The unfortunate delay has prevented securing anything like the amount of data we hoped would be available because the shipments of Flarimeters were not completed until June. Our greatest disappointment is that the member companies of this Association which ordered instruments did not receive them in time to accumulate data and experience before this meeting.

A tolerance of 4 per cent. was established for the large orifice, and the average error in fifty which were sampled from the shipments was ±2.4 per cent. This precision of manufacture will probably be improved when production becomes routine.

The Flarimeters have been standardized to read correctly in a room 25°C. (77°F.), the volume of air saturated with water vapor at 37°C. (98.6°F.), the temperature and condition of air in the lungs. This is the true vital capacity at standard room temperature, but it must not be forgotten that all past work on vital capacity which has come to our notice has ignored the temperature factor entirely.

It seemed advisable to introduce temperature standardization at this stage, before vital capacities are much used in life insurance, for two reasons: (1) because the correction is small, (2)

because at first the performance is apt to fall below par, and so the old tables, which neglect temperature, will not be so difficult to meet. If the temperature standardization is introduced now, then future tables will refer to true vital capacities.

Some may object to the choice of 25°C. as the standard room temperature. If 20°C. (68°F.) were chosen, the old instruments and tables would become 10 per cent., instead of 7 per cent. too small. Moreover, the Flarimeter will be used mostly indoors, where the temperature is above 20°C. more often than it is below, especially in summer. On the whole, therefore, 25°C. seems to be the appropriate compromise, for some temperature must be chosen as standard to procure uniformity in vital capacity statistics.

Satisfactory production of the portable steps for exercise also presented many difficulties. We finally induced Messrs. Becton, Dickinson & Company to arrange for their manufacture and introduction to the profession. They are a great improvement over last year's model.

Further study and experience with the Flarimeter and steps has convinced us that their combined use is essential to securing the greatest possible value from Test V of the series of tests used.

At the present time there are about 500 Flarimeters and 200 sets of steps in the field, in addition to those being used by selected examiners.

STANDARDIZATION OF TECHNIQUE

The form for recording the tests has been changed by omitting the initial systolic drop, combining the three blows, formerly Tests III, IV and V under Test III, changing Test VI to Test IV, and elaborating Test VII—now called Test V. The changes in Test V are important and the data thus obtained may prove to be the most enlightening of the series. We will, therefore, discuss this Test in some detail.

It must be done on schedule time, carrying the schedule directly through from the commencement of Test III.

TIME SCHEDULE TEST V.

Seconds
30-45 **Pulse Rate** Record
20-60 } Standard exercise for 90 sec.
60-50 } See table for number of asc'ts
Record " "

[If no steps are available, use 30 bending movements in 1 minute, beginning at mark 50 on the dial.]

55-60 **"Inspire!"**
60 **"Blow!"** Record length
45-60 **Pulse Rate** (per min.) Record
5-10 **"Inspire!"**
10 **"Blow!"** Record length

It begins with taking the pulse rate thirty seconds after completion of Test IV. The correct number of ascents to be given has already been looked up and recorded in the proper box at the time the name, sex, age, etc. are recorded immediately following Test II. This permits following the time schedule, as a glance at the form will show the proper number. After taking the pulse there is an interval of 35 seconds, which allows time for the applicant to stand up, approach the steps and prepare to ascend them. The exercise occupies 90 seconds. Immediately after it is completed he seats himself before the instrument, takes a deep breath and blows as long as possible beginning as before at the 60-second mark on the dial. Marked shortening of the blow will be noted. One minute and 45 seconds after the beginning of the blow the pulse is again counted for fifteen seconds. This gives its rate at the end of two minutes. The second blow following a deep inspiration is begun ten seconds later and except in those especially fit will be finished by the end of the third minute following the exercise. One may expect this blow to be very nearly, if not quite, as long as the longest blow in Test III.

It will be noted that in this test, in addition to controlling the exercise by use of the steps, we have used the Flarimeter to obtain a measure of the shortness of breath which may indicate the extent of oxygen debt incurred by the exercise and of the ability to clean up this debt as shown by the length of the second blow.

The reduction of the small orifice blow by exercise is very striking, but still more remarkable is the fact that the vital capacity is not reduced at all by the exercise. This crucial experiment proves that vital capacity is not a measure of shortness of breath, as Peabody and Wentworth* believed because it was so reduced in heart disease, but that the shortness is measured by the breath-holding ability. As now standardized this test gives three responses to exercise: (1) shortening of the blow immediately after, (2) extent of return of pulse towards its original rate, at end of second minute; (3) length of blow which is finished about three minutes after exercise. With further study these may be shown to check one another so that if two out of three check doubt will be thrown on the accuracy of the discrepant response.

The importance of such mutual checks on functional tests cannot be over-emphasized, and a careful study of our technique will show the importance we have attached to this point of view.

Unfortunately, it is impracticable to insist on using the steps when examination is made in the home or office of applicant. The examiner's office is really the place for such a test. When examination is made in the home or office of applicant a certain amount of information may be obtained from the bending movements by checking them with the length of blow ten seconds and again two minutes after the exercise is completed. If the length of the first blow is reduced to the normal value and the second also shows a value close to the normal for the standard step exercise, it is presumptive evidence that as much oxygen debt was incurred by the bending movements as would have normally occurred with the steps, and there is still left as an aid to interpretation the two minute return of the pulse rate. Of course, the chances of faulty performance and unsatisfactory responses not checking are now increased, but even so, the prospects of suc-

*F. W. Peabody and J. A. Wentworth, Arch, Int. Med. 20, 443-467, 1917.
To demonstrate the effect properly, the gasometer type spirometer should be used for the vital capacity, with a Flarimeter small orifice blow immediately after. Most of the effect can be shown with the large orifice of the Flarimeter for vital capacity, but under such conditions the breath-holding time is so reduced that it is a limiting factor even for the large orifice blow.

cessful interpretation are very much better than they are without any such control of the severity of the bending movements.

The same system of checking pervades all five of the Flarimeter tests. There are four values of the pulse rate at rest, five of the systolic pressure at rest, two of the diastolic, three vital capacities, three values of T20, three of maximum systolic rise, and five lengths of blow through the small orifice. Nor do the possibilities of checking end with these for we have change in the size of pulse pressure, and rise or fall in the diastolic between Tests I and IV. Dr. Frost has emphasized the value of trends in the systolic base line from test to test. There are also certain definite relations between the values of T20, Tm, and S+, to be explained later, which must appear in any normal systolic response and these again serve as important checks.

The first result to be obtained from this multi-checking system is a fairly accurate estimate in the Home Office of the reliability of the examiner's report, next of the applicant's emotional disturbance, and then the values of his performance. With these three factors properly discounted there usually remains ample material for a picture of sufficient accuracy and detail to enable those who pass on a case to be fairly confident of the circulatory fitness of the applicant. By comparing a series of measurements in this way with a standard performance, each test serves as a control on the others, and an estimate of the circulation is obtained that must ultimately show its superiority to the present method of random observations which give but scant knowledge of the applicant's true state at the moment.

One of the advantages of the technique as developed is its tendency to stabilize the subject by distracting his attention from himself to interest in satisfactory performance. The examiner has learned where to look for his blood pressure in Test I, and the applicant how to blow in Test II. The applicant has become more composed in these two tests, has learned how to blow steadily, and has become familiar with the subjective sensations during a blow. He has been urged to put forth a real effort, and so both examiner and applicant should be able to cooperate to pro-

duce the scheduled tests III, IV and V on time. A definite time limit up to this point is not necessary, but when Test III is begun time becomes an important element and the schedule should be accurately followed through to the end of Test V. Perfunctory performance fortunately parades as impairment, and no applicant can exceed his physiological limit. Both examiner and applicant have every incentive to do their best. The true significance of the performance will undoubtedly increase as the examiner's experience grows.

FLARIMETER REPORTS FROM UNSELECTED EXAMINERS

A number of our unselected examiners who were asked to send in Flarimeter reports have responded. To date over 200 reports from them have been received. We feared that in spite of carefully prepared instructions they might find the test complicated and difficult to perform. Our experience with selected examiners who were personally instructed in the technique showed us that the tests were practicable in the field, but the apparent ease with which the unselected examiners have read our instructions, trained themselves, and promptly sent us satisfactory reports, has come to us as a complete surprise. Some gave reports which showed perfect technique from the start. Most were on the whole correct. A few were disappointing. Considering that practically none of them have received any personal instruction, the results appear to be surprisingly good. After all, the tests must be really very simple to be learned so quickly by correspondence. We feel confident in predicting, at this early stage, that Flarimeter tests will eventually be as practicable in the field as routine blood pressure and exercise tests are now, while the better standardization alone must make the results more valuable.

The lengths of the blows, which are the backbone of the tests, offer no difficulty except getting the best out of the applicant. Some doctors seem very much impressed with faulty performance, others accept it as a matter of course. Good examiners always follow our instructions to state their "estimate of the performance of the appliciant, how hard he tried to cooperate, and

how well the time schedule was kept." Undoubtedly, there will be differences in the skill with which different examiners can elicit the best performance, but skill in this will surely increase with practice. Similar skill is required to keep the time schedule, for the doctor must not dally, but there is really no great difficulty in following the systolic pressure. Most difficulty is experienced with "T20," the time required for the systolic pressure to rise 20mm. during the small orifice blow. This we expected, for the concept itself is a little abstract.

It is too early, as yet, to measure the performance in the trial reports, but the first 76 tests on adult males (first-class standard risks without present or previous impairments) sent in by 38 unselected field examiners are summarized in Table 1. They compare favorably with those from selected examiners, and with those made in the Home Office. The median vital capacity is 4 per cent. above normal by the tables of Myers, probably because of the temperature standardization of the Flarimeters. The median maximum length of small orifice blow is 55, compared with 59 seconds, the median maximum for 88 normals presented to this Association a year ago. The average deviations are also about the same. Both T20 and S plus are below our normal figures, which indicates that all have not yet reached proficiency in observing the systolic responses, or in obtaining a maximum blow.

TABLE 1

FIELD TRIAL FLARIMETER TESTS ON ADULT MALES

(First 76 Reports on First-Class Risks by 38 Unselected Examiners)

VARIABLE	No. Exam.	No. Cases	Median	Average Deviation	Quartiles Upper	Quartiles Lower	Range High	Range Low
Age	38	76	31	7.3	38	25	57	20
Vital Capacity % of Normal	38	76	104	10.6	116	96	125	77
LENGTHS OF BLOW								
Max. Test III (Tm, sec.)	38	76	55	7.8	60	48	70	24
10 sec. after exercise (Te, sec.)	38	75	20	5.9	26	17	56	12
2 min. after exercise (Tr. sec.)	19	35	46	8.2	55	40	77	18
SYSTOLIC RISE								
Maximum (S+, mm.)	38	76	28	8.4	36	23	68	4
Standard, 20 mm. (T20, sec.)	34	69	37	8.0	45	30	52	14

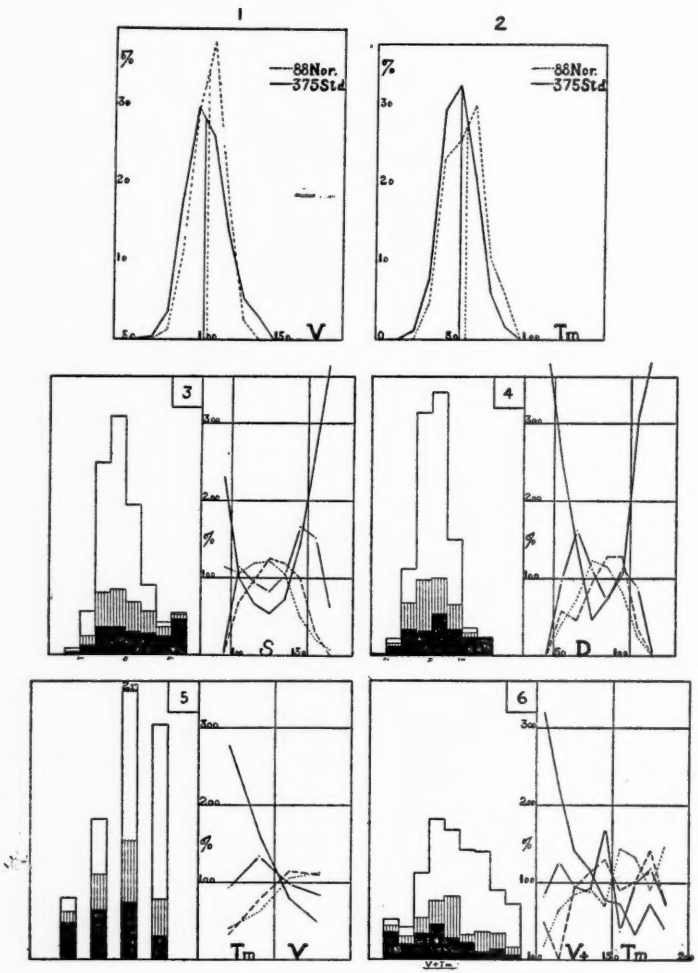
The most interesting results are the lengths of the small orifice blow after exercise, the median, 10 seconds after, being 20 seconds, that two minutes later 46 seconds. Unfortunately, the exercise was standard (correct number of ascents over the steps) in only one-third of the tests, so that the doctors evidently do not yet appreciate standardization sufficiently to give the right number of ascents. Of course, in cases outside the office they do not want to use the steps. In most of the tests the oxygen debt incurred by exercise is not quite cleaned up in two minutes, although in four tests the return blow was actually longer than before exercise.

When interpreting these lengths of blow it must be borne in mind that during the blows no oxygen debt can be cleaned up, so that a long blow immediately after exercise postpones recovery longer than a short one does. Moreover, a coached applicant can force his breathing between blows and, by thus hastening his recovery, increase the length of his next blow. Overbreathing occurs unconsciously just after each blow and probably is the reason why the second blow of Test III is usually longer than the first. Flarimeter tests cannot be interpreted correctly unless the time schedule is known.

These early reports indicate that the length of the first blow after exercise depends somewhat on the doctor as well as the applicant, but this may be merely a sampling effect due to the small number of tests, as it appears only in this test and not in the lengths of the other blows. In about one-half the tests the doctors recorded their estimate of the performance, and it is significant that only one normal in 76 was recorded as poor performance. Five were reported as poor at first. Less than one-third of those failing to report showed any evidence of poor performance.

FLARIMETER REPORTS FROM SELECTED EXAMINERS

The frequency distributions of the vital capacities (V) and length of blow (Tm) of the first 375 Flarimeter reports from the selected examiners on standard adult male risks are compared with those on the 88 normal males tested in the Home


1
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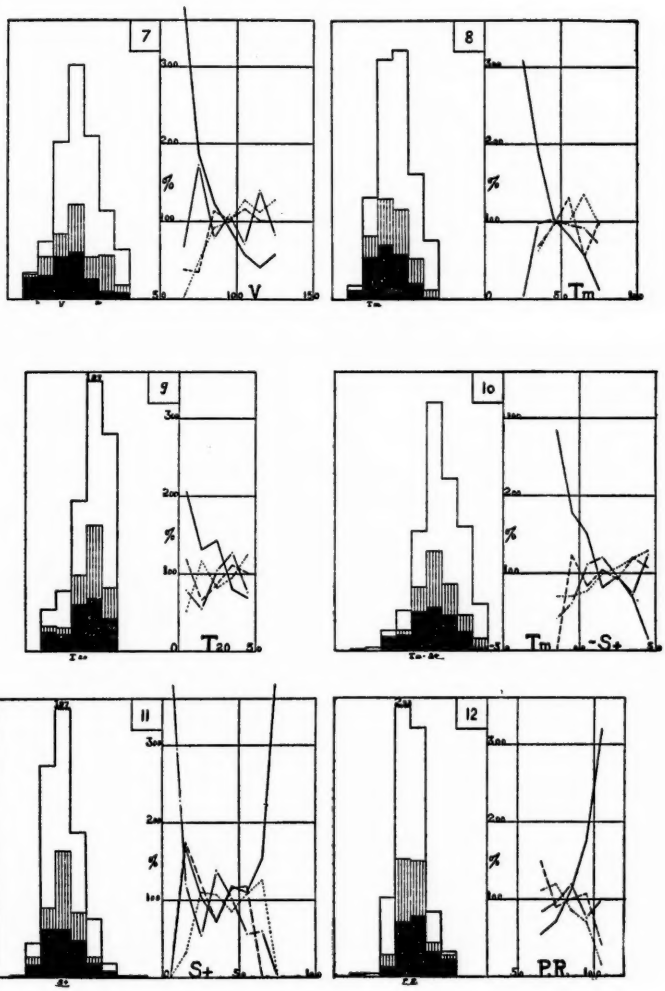
7
V
8
Tm
9
T20
10
Tm - S+
11
S+
12
P.R.

Office in Figs. 1 and 2, and the statistics briefly summarized in Table 2. The third column of the table gives the corresponding statistics on 323 first-class (without present or previous impairment) risks of the first seven hundred reports from the selected, the last column, 76 cases falling under the same classification, from unselected examiners. These distributions establish a standard by which to judge the reports from each examiner. The reason for the reduction in the median maximum Tm for the 323 first-class risks to 53 seconds from its value, 55 seconds, shown for the first 375 standard risks, which one might expect to be lower because standard risks with impairments are included, can probably be assigned to the fact that the 72 reports from one examiner were excluded. The values of Tm he submitted were too uniformly high to be reliable, and other details of his reports confirmed the suspicion. No reports from two other examiners are included in this column because none met the required standard.

It is evident that either the applicants do not average quite as high as the Home Office normals, or the examiners have not elicited quite as good performance, but the differences are small. There is a little more variation from the median among the field than among the Home Office cases, and more of them fail to meet the borderlines thought normal at present. The vital capacities from the selected examiners are corrected for temperature by adding 7 per cent., and so are those for the Home Office normals, but this is not necessary for those from unselected examiners as their instruments were standardized. Apparently, the unselected examiners reported fewer subnormals than did the selected examiners. These first 76 reports are too few in number to justify either too close comparison with similar figures in the other columns or criticism of the examiners.

TABLE 2.

COMPARISON OF FIELD AND HOME OFFICE FLARIMETER RESPONSES

375 Standard Adult Male Risks from 14 Selected Examiners.
88 Normal Adult Males tested in the Home Office.
323 First-Class Standard Adult Male Risks from 11 Selected Examiners.
76 First-Class Standard Adult Male Risks from 38 Unselected Examiners.

	375 Std.	88 N.	First-Class 323	Standard 76
Median Max. Vital Capacity (V, % of Normal)	106	108	107	104
Average Deviation (single case from Median)	11.1	8.4	10.6	10.6
Percentage of Cases, V less than 92%	28.5	2.4	9.0	7.9
Median Maximum Length of Blow (Tm, sec.)	55	59	53	55
Average Deviation (single case from median)	10.4	9.8	9.0	7.8
Percentage of Cases, Tm less than 40 sec.	8.8	4.6	7.7	7.9

In the Charts 3 to 13 are presented the Flarimeter responses of the first 500 reports on adult males from the selected examiners. The results are compared with Company action on the cases, which is the nearest we can get at present to a mortality experience. In not more than six cases were Flarimeter responses allowed to influence our judgment as to rating or rejection. The systolic and diastolic pressures and the pulse rate, while the applicant is at rest, are shown for comparison. These values are taken from Test IV because those of Test I are more likely to be vitiated by emotion.

The procedure was to classify first the Company action in four groups:

(1) 220 cases without impairment, given standard rates (First-Class Standard).

(2) 78 cases with impairments, given standard rates (Second-Class Standard).

(3) 94 cases Rated (A, B, C, D).

(4) 108 cases Rejected.

Cases with occupational and other non-medical ratings were excluded from the series. Each of these four groups were subdivided separately for each Flarimeter response of interest into a number of classes, Systolic (S) and Diastolic (D) giving 8 classes each, by 10 mm. class intervals (Charts 3 and 4); vital capacity (V) 7 classes by intervals of 10 per cent. of normal (Chart 7); length of blow (Tm) 6 classes by 10 sec. intervals

(Chart 8); maximum systolic rise (S+) 9 classes by 10 mm. intervals (Chart 11); (V+Tm) and (Tm—S+) 9 classes each (Charts 6 and 10); pulse rate (R) 7 classes by class intervals of 10 beats per minute (Chart 12); and 5 classes of T20 by 10 sec. intervals (Chart 9). The resulting distributions are shown by the histograms at the left of each chart, where the black areas represent the numbers of cases rejected in each class, the shaded areas those rated, and the clear areas those accepted at standard rates.

At the right of the charts are shown curves which represent the percentages of cases in each Flarimeter response class, relative to the number which random sampling would assign to that class. For example, with 500 cases distributed in vital capacity in the given manner (somewhat like Fig. 1), a random sorting into the four rating groups would give the same frequency distribution among the Flarimeter classes for each of the four groups. The number of cases in each class would also be in proportion to the size of the group. If there were no correlation between the Flarimeter response and Company action, the actual numbers would be thus distributed, and then all the curves would reduce to the horizontal 100 per cent. lines on the charts. If twice as many rejected risks have a particular Flarimeter response, as expected on this basis, the rejected curve passes through 200 per cent. at that response, if half as many, the curve registers 50 per cent., etc.

The solid lines represent the percentages of rejected cases, the dot-and-dash the rated, the broken lines the "second-class standard," and the dotted lines the "first-class standard" cases. Chart 5 differs from the rest in that the Flarimeter responses are classified discontinuously, that is, classes from left to right, represent cases where

(1) *Both*—V is under 92 per cent. *and* Tm under 40 seconds.
(2) *Either*—V is under 92 per cent. *or* Tm under 40 seconds.
(3) *Either*—V is 107 per cent. or over, *or* Tm 40 sec. or over.
(4) *Both*—V is 107 per cent. or over *and* Tm 40 sec. or over.

It will be recalled that the normal borderlines reported last year were 85 per cent. (now corrected to 92 per cent. for tem-

perature), for vital capacity (V) and 40 seconds for length of small orifice blow (Tm). This classification of V and Tm correlates better with the Company action than does their sum (V plus Tm), as a comparison of the Charts 5 and 6 will show. Rejected cases have four to six times the chance of giving subnormal responses in both Tm and V that they have of giving normal responses in both, and standard cases have less than half the chance. The curves (V+Tm), also, show the same tendency for the rejected (solid) percentages to fall with increasing response, while those for the normal cases (dotted) rise.

In general it is found that large values of V, Tm, (V+Tm), (Tm—S+) and T20 tend toward favorable ratings, and vice versa, while the systolic (S) and diastolic (D) pressure and maximum systolic rise (S+) show optimum values above and below which the ratings tend to be unfavorable. Intermediate values tend toward intermediate ratings, but the agreement is not so pronounced as with rejected cases. The results are somewhat confused by having too many classes for such a small number of cases. Nevertheless, the general regularity of the curves demonstrates that the Flarimeter responses are correlated with Company action.

INTERPRETATION

The median values given in Fig. 13 represent the best standard available at present of a typical Flarimeter report on a normal applicant (standard risk without known impairment). Nevertheless, the values must be accepted with reservations. Not all the 323 reports from 11 selected examiners on first-class adult male risks were complete, so that some of the statistics do not refer to all the cases. This may explain the drop in vital capacity in the third blow, based only on 237 values, and the rise in the third T20, based on 233 values. The other statistics of Test III will probably stand, although only 245 reports included a third blow, while the first two T20's are based on only 298 and 302 cases, respectively. They are in every detail just what would be expected in a normal case. The statistics in Test V are less reliable, as only 80 reports were standard, the others using the

FIG. 13

THE PRUDENTIAL INSURANCE COMPANY OF AMERICA

Synopsis of Technique for Flarimeter Tests

Test I

Pulse Rate
Systolic Pressure
Diastolic Pressure (4th point)

Test II *Repeat twice*

Vital Capacity
Seconds X 0.2 = Liters

Test III *Repeat twice*

Seconds
25-45 **Systolic Pressure** Deflate—Record
55-60 **"Inspire!"**
60 **"Blow!"**
10 Inflate—**T20** in seconds
Maximum Systolic
Total Length of Blow Deflate Record

Test IV

30-45 **Pulse Rate** Record
30-60 **Systolic and Diastolic** Record Remove cuff

Test V

Seconds
30-45 **Pulse Rate** Record
20-60 } Standard exercise for 90 sec.
60-50 } See table for number of asc'ts Record " "
[If no steps are available, use 30 bending movements in 1 minute, beginning at mark 30 on the dial]
55-60 **"Inspire!"**
60 **"Blow!"** Record length
45-60 **Pulse Rate** (per min.) Record
5-10 **"Inspire!"**
10 **"Blow!"** Record length

Median Values for **RECORD OF TESTS**

Name 323 First-Class Risks Age Adult Sex Male Occupation Ht. ft. ins. Wt. lbs.

I		II			III				IV		V	
At Rest			Vital Capacity Sec.	Liters	Blows with Small Orifice				At Rest		Exercise Small Orifice Blow	
Pulse Rate	76	1	20	4.0		1	2	3	Rate	76	Pulse Rate before	76
Systolic	120	2	21	4.2	Systolic	120	122	124	Systolic	122	No. Ascents	22
Diastolic	78	3	20	4.0	T 20 Seconds	34	34	38	Diastolic	78	No. Bendings	-
					Maximum Systolic	150	155	156			Length of Blow, Sec.	18
					Total Seconds	42	50	50			Pulse Rate end 2 min.	72
This line for Home Office use only		% of Normal		107	S+	30	33	32			Length of Blow, Sec.	48
Remarks:					$(T_m - S_+)$	12	17	18				

The systolic falls from Tests I to IV in 48% of the cases and rises in 52%.

" diastolic " " " " " " 68% " " " " " 32%.

The systolic base line in blow 2 of Test III rises above that of blow 1 in 77% of the cases.

" " " " " " 3 " " " " " " " 2 " 62% " " " .

There was an irregular or falling base line in Test III in 23% of the cases.

Examiner 11 Selected Residence U. S. Date 1929-30 Hour

cmw 12263 mwm

wrong number of ascents or merely the thirty bending movements. The final blow, two minutes after exercise (Tr), was reported in only 54 cases, as this feature was so recently introduced in the field.

The distribution of vital capacity (%V) and length of blow (Tm) by age is recorded in Table 3, giving the median values

TABLE 3

MEDIAN MAXIMUM V AND Tm BY AGE

(323 "FIRST-CLASS STANDARD" ADULT MALE RISKS FROM 11 SELECTED EXAMINERS)

Age	No. Cases	% Cases	% V	Tm (sec.)
Under 20	12	3.7	101	46
20–29	112	34.7	111	56
30–39	108	33.4	104	51
40–49	74	22.9	106	53
50–59	16	5.0	118	52
60 and over	1	0.3	122	35
Median			107	53
Av. Dev. (Single case from median)			11	9

for each decade shown. The vital capacities vary exactly as one would expect. The vital capacity is known to increase with age under 20, as well as with height, and to decrease slowly with increasing age after maturity. Now each case over forty has been given 1 per cent. per year in addition to his percentage from Myers' table, but this correction is evidently too much, and so the medians increase after forty. One-half per cent. per year over forty would probably be nearer the average decrease with age. The medians for Tm are not significantly different from the general median, that is, the length of blow does not vary with age. The correlation of Tm with age among the 88 normal adult males tested in the Home Office was also negligible ($r = 0.17$). A few tests indicate that even little children can hold their breath nearly as long as adults. One little girl of eight had no difficulty in blowing over 60 seconds.

The first point to interpret in Flarimeter reports is the nervous factor. There is no evidence of this in Fig. 13 because it is smoothed out by taking medians. Nervousness is usually most

marked during Test I, due to apprehension, but it tends to pass off as the tests proceed, especially if the attitude of the examiner is reassuring. Because of this we expect lower values in the fourth than in the first, although the changes are usually negligible in first-class risks, as shown under remarks in Fig. 13. Nervousness may be indicated also in the fluctuation of the systolic base-line in Test III, and probably explains the 23 per cent. of cases with irregular or falling base-lines. The normal rise from blow to blow may be dominated by emotion which is usually decreasing.

In abnormal cases, Stieglitz* has shown that the emotional fluctuations in systolic blood pressure may exceed 50mm., and he suggests that emotional hypertension is likely to become permanent and lead to degenerative circulatory changes. Until mortality experience indicates otherwise, therefore, fluctuations exceeding 20 mm. should be suspected. Moreover, in these cases T20 is often short (under 30) and (Tm—S+) may also be small or even negative, giving a clear picture of irritability. In view of the fact that short T20's and values of the systolic rise (S+) even larger than the length of blow (Tm) are so often found in cases impaired on account of heart disease, toxic goiter, overweight, nephritis, diabetes, and pulmonary tuberculosis, they must be regarded as suggestive of actual impairment. These findings are to be expected in the earlier stages of impairment; later, however, when the degenerative changes have advanced to the point where compensation begins to fail, T20 would be expected to grow smaller until the systolic fails to rise even 20mm., and (Tm—S+) becomes smaller or increasingly negative. Flarimeter reports already bear out this interpretation although they are not sufficiently numerous to attempt quantitative scales.

The diastolic tends to vary less than the systolic pressure from Test I to Test IV, as is evident even in the medians (Fig. 13). Usually, it falls slightly just as it does after exercise, although the small orifice blows of Test III represent quite a different

*E. J. Stieglitz, Am. J. Med. Sci. 179, 775-82, 1930.

type of load on the heart, and the recovery should be practically complete by the time the diastolic is taken in Test IV. The changes from Test I to Test IV, in normal applicants, therefore, are largely the result of decreasing emotion.

The diastolic is higher in Test IV for about one-third of the risks, and in these cases the pulse pressure is usually lower. When the changes are small, it seems reasonable to assume that this indicates a return to rest from a more active state in Test I, but an excessive rise in diastolic, combined with a distinct fall in pulse pressure, suggests severe myocardial involvement.

For simplicity in the field it is necessary to begin the blows of Test III at intervals of exactly two minutes. The test is, therefore, more severe for those who blow longer, for whom the rest periods between blows are shorter. This effect must be discounted before interpreting the responses. The systolic base-line tends to rise more, the pulse pressure to increase from Tests I to IV, the longer, and therefore better, the blows.

Little need be said about the measures of vital capacity and shortness of breath, as their interpretation is perfectly straightforward, and the extensive literature upon them is all in agreement. We have already noticed a tendency for the small orifice blow to be definitely shortened among overweights, even in those who show little or no reduction in vital capacity. On the whole, in fact, shortness of breath seems to be more sensitive to circulatory impairment than is vital capacity, but less sensitve than T20 and (Tm—S+).

The revised exercise test (V) with its measures of oxygen debt, the small orifice blows, is at present the most interesting of the Flarimeter tests. Its interpretation has already been sketched, and we hope to have soon enough normals to be able to adopt tentative standards. A comparison of the lengths of blow with the responses in systolic pressure and pulse rate is also under way. We have already accumulated many Flarimeter reports which illustrate and confirm our ideas of interpretation, but to present them would unnecessarily burden the Proceedings.

DR. WILSON—Mr. President and Fellow Members: The value of some test of "longevity of the heart", a term used by Professor Henderson last year, is most important. The value of such a test, of course, is going to depend upon the ease with which it is done, the brevity of time required, and the greater the number of people that it can be applied to. A functional test, as Professor Henderson pointed out, is, in a measure, a test of heart efficiency and heart reserve rather than heart longevity, which is the thing that we desire to find out, and while these tests are not of as great value to insurance as they are to clinicians, yet they do have a value if we take into consideration the underlying cause for the impairment of efficiency or of heart reserve.

The underlying cause for this inefficiency, or lack of reserve, may be temporary, such as overweight. We all have seen cases where marked overweight has shown a definite functional loss. They can't play golf because they get out of breath. That's a functional test. Take the weight off that man and he plays without effort. He does not get out of breath. So there we are dealing with a temporary impairment, which may be corrected.

Again, we may have a permanent impairment which is not progressive. You take certain cases of valvular heart disease. We see them and trace them. I have one at present under observation, a woman who had mitral stenosis at age 12. She was an owner of a boarding house, and lived an active life without symptoms, and only at age 60 developed fibrillation. This is an example of impairment which, in her case, was a permanent one, but not progressive. The progressive type is very well shown in our cases of hypertension.

I don't think that any of us appreciate fully the work of Dr. Fisher on hypertension unless we read over his report in 1914 when he showed that in 1,082 cases of hypertension with absolutely no other impairment there was a mortality in these cases *that were traced after rejection* (please note that) of above 179 per cent. compared with the M. A. table.

In examinations for insurance there are two definite types of tests. One which can be applied to all to discover an unsuspected impairment and perhaps grade it. The best example of this type is the blood-pressure estimation which requires a minimum of time, a relatively cheap and portable instrument, and a result that can be expressed in figures and re-checked. The second type of test is one that can be applied to a *definite* group to differentiate the degree of abnormality, and the best examples of this type are the various sugar tolerance tests. As this type of test need only be used on a very limited number of applicants, if the group is *definite,* therefore the requirements for the test are not the same and a longer time can be spent on the examination (and paid for) but the test should be simple and the result of the test be expressed accurately in figures.

Is there at the present time any functional test of the heart that falls in either of these two groups? Certainly none come under the first group, namely that can be applied to *all* applicants and requiring a minimum of time. In both the Cardio-Respiratory and Flarimeter tests the time required for the test is longer than the time required for all the rest of the examination and no one has suggested that it be applied to all applicants. It may be of interest to know how long it takes to make a physical examination. We have been checking up in the telephone service the length of time required to make a thorough physical examination of all applicants for employment. Here our examinations are more thorough, because we tried to find out the degree of likelihood of disability rather than longevity, a much more difficult problem, requiring much more detail in examination. Therefore, the examination must be more thorough. We found that with the prospective employee, stripped and ready for examination and a physician trained in such examinations, it took ten minutes to make that examination. That examination includes examination of the eyes, pupils, exophthalmos, ear drums, the throat, the teeth, thyroid, heart, blood-pressure, lungs, and then in the case of males the question of deformities, flat foot and all those things that lead to

disability. And yet that test takes only ten minutes for the whole examination. Not infrequently the time required for either of the above two cardiac functional tests is fifteen minutes which of course rules it out as a routine test. Functional tests of the heart do not fall in this second type of test since the group to which it is applied is not *definite,* but is composed of: (1) Those who have had certain diseases (i.e. Rheumatic fever); (2) applicants who are overweight; (3) those over a certain age; (4) those showing abnormalities of heart or circulation on examination and (5) those having suggestive symptoms such as shortness of breath, chest pain or discomfort and indigestion. Including all these sub-groups we will probably fail to use the test where most required, namely in "silent" myocardial and coronary disease.

Both the cardio-respiratory test and the Flarimeter test are made up of a number of factors, and I believe that time will show that certain of these factors are far more important than others, but this can only be found out by a careful study of the rejected applicants as Fisher did, and by an analysis of the tests in cases where the expected "expectation of life" was not achieved, and especially so in those cases where death was caused by the "degenerative diseases". It is my belief that there will grow out of these two functional tests eventually a far simpler test based on vital capacity and variations in intra-thoracic pressure, as shown by blood-pressure changes, and if I am right I know of no other method of arriving at such a simplification of the above two tests than the analysis I have mentioned above.

The dependability of either of these two tests will take a great many years to decide, as a "delayed mortality" can be expected, and I venture to say that any A-1 clinician can pick out a group of heart impairments, and without any functional test obtain a group that will show a normal mortality for ten years. The "delayed mortality" is certainly suggested by the fact that according to the M.A. table, the rate per ten thousand exposed to risk in the group 15 to 29 years old was 1.4, rising

to a rate of 4.0 in the age group 25 to 44, and rising more abruptly to 19.9 in the age group over 45.

In closing I want to say how much I appreciate being asked to discuss this paper, and to voice my belief that out of this work there will eventually come a simpler test of heart longevity. This splendid work of Dr. MacKenzie as well as the work of Dr. Frost is truly appreciated by this Association.

Dr. Frost—Dr. MacKenzie and his collaborators are to be congratulated upon the progress which they have made during the last year in laying the foundation for their study of circulatory impairments by means of the Flarimeter Test. The further standardization of the Flarimeter, of the portable steps for exercise, the consolidation and simplification of the technique of the Flarimeter Test and, finally, the introduction of some 500 Flarimeters and 200 sets of steps in the field have involved a task by no means simple or easy. I can testify to this from experience, inasmuch as we, of the New England, have gone through a similar experience.

In my discussion of the paper presented by Dr. MacKenzie and his collaborators a year ago, I stated that the particular element in the technique of the Flarimeter Test which most interested me and which I thought would be of great value was the determination of the decrease of the length of blow through the small orifice after exercise. My opinion in this respect is unchanged, and I am interested to observe that the authors share it. The combination of this determination and of the result of exercise upon the pulse rate, as indicated in the present Step V, is an excellent one. It is common knowledge that the comparatively mild degrees of circulatory impairment, such, for instance, as result from impaired physical condition due to lack of exercise, or from excessive smoking, first manifest themselves by the symptom of air hunger on slight exertion and by the signs of increased rate of respiration and heart action. The authors, in my opinion, rightly contend that the diminution of blow following exercise is a manifesta-

tion of air hunger or of oxygen deficit, rather than of decreased vital capacity.

As for the question of vital capacity, I still believe that, with respect to the degrees of circulatory impairment presented to us in life insurance applicants, we can hope for little, if any, assistance from its determination.

A standardized method of exercise is, undoubtedly, a necessity in any reasonably accurate test, by exercise, of circulatory function. In my mind, there is no question as to the superiority of the portable steps which the authors have developed for this purpose over the form of exercise obtained by bending movements of the body. It is obvious that the amount of exercise involved in the latter procedure will vary for different individuals according to their build, etc. However, the exercise by means of the steps can be adapted to the physical characteristics of each individual.

I am interested in the comment of the authors upon the effect of the emotions upon systolic blood pressure. They have quoted Stieglitz as suggesting that emotional hypertension is likely to become permanent and lead to degenerative circulatory changes. For some time I have believed that the transient hypertension so frequently observed, particularly in young adults, apparently resulting from emotional disturbance, is the forerunner, probably the initial sign of a later permanent hypertension, with the resulting later physical degeneration which we have come to know as hypertensive disease. In our work in the New England Mutual Life, this is one of the phases of hypertension which I am watching with the most interest. It will, of course, require a number of years to collect any conclusive data upon this subject. To the present, I have observed no developments in our own experience supporting this hypothesis.

The correlation of the responses to the Flarimeter Test with Company action is interesting and suggestive, but, of course, not conclusive. The fact that the authors have found the short 20's and the larger values for the systolic rise in suggestive association with circulatory impairments, overweight, nephritis,

diabetes and pulmonary tuberculosis is of decided interest to me. We have found, in our experience with the Cardio-Respiratory Test, that those two factors are elements of what we call the hyperactive reaction. In our analysis of our experience to the present with this test, which will be given in more detail later, it appears that our highest mortalities have been obtained in that group in which the reaction to the Cardio-Respiratory Test could be classed as hyperactive.

I wish again to express my high appreciation of the care and thoroughness with which the authors have laid their foundation for the obtaining of a large amount of data bearing upon the utility of the Flarimeter Test. As I stated last year, this is a type of work toward which the New England Mutual Life is perculiarly sympathetic and in the successful conclusion of which we offer to Dr. MacKenzie and his collaborators our most sincere good wishes.

In conclusion, I am taking the liberty, with the consent of our President, of presenting to the Association the results of a current investigation of the group of risks which we have insured during the last eight years by our method of selection based upon the Cardio-Respiratory Test. I regret my inability to give you our complete results inasmuch as our investigation has not been finished.

CARDIO-RESPIRATORY TEST.

This investigation is based upon 4,936 lives, with 14,940 years of exposure, insured by us during the eight-year period from January, 1922, to December, 1929, inclusive, and is carried on to July, 1930. The expected deaths, by the American Experience Table, were 165.42, while the actual deaths were 70. This gives a mortality for the whole class, by the above table, of 42.32%. In comparison, the general mortality of our Company business, for all policies ten years old and less, has been 41.50%.

The following table gives the number of lives and mortalities for sub-groups, based upon the chief impairment for which the Cardio-Respiratory Test was given:

TABLE I

	Lives	*Mortality*
Heart Murmur	2,523	46.36%
Heart Enlarged	139	34.54
High Blood Pressure	504	48.47
Low Blood Pressure	123	24.57
Pulse	517	63.36
Goitre	466	29.59
Overweight	267	55.71
Class made up of history of		
Heart Disease	99	No deaths
Other Circulatory	110	" "
Other Urinary	6	" "
Underweight	7	" "
Sugar	13	" "
Miscellaneous	162	" "
	397	

In order to obtain an idea as to the effect of the nature of the reaction to the Cardio-Respiratory Test upon the mortality, we subdivided the whole group according to the following table, which indicates the nature of the reaction, the number of lives and the mortalities by reactions:

TABLE II

Reaction	*Lives*	*Mortality*
Normal	1,512	29.89%
Hyperactive	559	76.38
Hypoactive	460	26.08
Atypical	1,921	43.40

It is apparent from the above table that the hypoactive and normal reactions have given us the lowest mortalities, while the hyperactive reactions have given us the highest. It should be pointed out that the normal reactions were those in which there were no abnormal elements. The other three types of reactions, hyperactive, hypoactive and atypical, were those in which there were certain elements of the reactions which were hyper- or hypoactive or atypical, but not sufficiently so, in our judgment at that time, to warrant rejection of the risk. With but few exceptions, the reactions which were definitely hyper- or hypo-active or grossly atypical have called for rejection of the risk. In order

to make clear the exact nature of these abnormal elements of the reactions, a list is given below.

Hyperactive

(1) A reaction curve which rises excessively in Steps Five to Eight, more than 50 points above the base-line.

(2) A base-line curve which rises eventually more than 10 points above the initial pressure.

Hypoactive

1. A reaction curve which fails to rise in Steps Five to Eight to a point 20 to 50 degrees above the base-line level.
2. A base-line curve which drops progressively to a point more than 5 degrees below the initial systolic pressure.
3. A reaction curve which fails to drop in Step Two and Four more than 10 points below the base-line level.

Atypical

1. A reaction curve which shows a progressive tendency to fall away in Steps Six, Seven and Eight.
2. A reaction curve which fails to drop in Step Two more than 10 points below the base-line level.
3. A reaction curve which fails to drop in Step Four more than 10 points below the base-line level.
4. A base-line curve which fluctuates markedly from step to step.
5. A pulse pressure which, at the end of the test, has decreased more than 10 points.
6. A pulse rate which, at the end of the test, has increased more than 10 points.
7. A vital capacity which progressively decreases in Steps Six, Seven and Eight.

By eliminating, from the whole of the above class, those types of reactions which have given the highest mortalities, amounting to 950 lives, we find that we should have a remainder of 3,986 lives, with a mortality of 33.99%, as compared with the mortality of 42.32% for the entire class.

The following table indicates those types of reactions which have given us the highest mortalities and the resulting mortality with their elimination.

	Lives	*Mortality*
Hyperactive	559	76.38%
Progressive drop in Steps Six to to Eight	34	135.14
Steps Two or Four did not drop 10 points	141	63.83
Irregular base-line with Step Two or Four which did not drop 10 points	113	78.53
Irregular base-line with pulse rate which increased more than 10 points after test	67	93.46
Pulse rate increased more than 10 points after test	36	119.05
Whole class	4,936	42.32
By eliminating above reactions there remain	3,986	33.99

The group of Heart Murmurs was also subdivided according to reactions with the following results:

TABLE III

Reaction	*Lives*	*Mortality*
Normal	830	25.77%
Hyperactive	302	53.48
Hypoactive	211	42.25
Atypical	1,016	49.55

The group indicated in Table I, as Pulse, 517 lives, is composed of those individuals showing Irregular, Intermittent, Rapid or Slow Pulse. Subdividing this, we find that the Intermittent or Irregular Pulse group, 348 lives, has given us a mortality of 76.86%; whereas the Rapid or Slow Pulse group, 163 lives, has given us a mortality of 37.04%.

Subdividing the Intermittent or Irregular Pulse group, we find that the mortality at ages under 45 has been practically the same as that at older ages; namely, 75.99% as compared with 77.37%.

Subdividing according to the nature of the reaction, we have the following table:

TABLE IV

Reaction	*Lives*	*Mortality*
Normal	101	129.03%
Hyperactive	42	.....
Hypoactive	45	65.36
Atypical	150	73.66

It is apparent that the group with Intermittent or Irregular Pulse has given us a mortality considerably in excess of the average and that the low mortality associated with the normal reactions in the class as a whole and in the largest group, that of Heart Murmurs, is not in evidence here. I have felt for some time that, in dealing with irregularities of the heart action, the electrocardiograph would be most useful in indicating the exact type and probable source of the disturbance of rhythm. Upon the basis of the facts as given by the ordinary clinical examination, I think it quite probable that irregularities of serious significance may be unwittingly considered favorably for insurance. With an electrocardiographic tracing their significance would be apparent and they could be eliminated.

It is our intention to continue along the lines indicated above in the subdivision of the other groups in the effort to determine just where the higher mortalities tend to occur. Our investigation, of course, will include a subdivision of the heart murmurs, according to the type, location, and transmission of the murmur.

The following table gives very briefly the causes of death, 70 in all:

	Number	*Per cent. of total deaths*
Circulatory	24	34.29
Tumor, Cancer, etc.	7	10.00
Suicide, Homicide	7	10.00
Accidents	8	11.43
Miscellaneous	24	34.29

I wish to express again my regret at my inability to give you the completed results of our investigation. We, of the New England Mutual, appreciate your interest in this work and it is our desire to keep you fully informed as to its progress. Dealing, as we are, with a group of circulatory impairments, it is reasonable to expect an increased late life mortality. For that reason, we

consider it necessary to control the early mortality rather rigidly. We believe that this investigation, incomplete as it is, justifies us in our opinion that the cardio-respiratory test provides us with a means of such control hitherto not at our disposal.

Dr. Bradshaw—Dr. Wilson has intimated that for the general life insurance examination these tests require so much time that it is not a practical thing. There was one point in this paper that I would like to ask Dr. MacKenzie about. Is any special significance attached to the inability to hold the breath 35 seconds? He states that holding the breath 35 seconds is a fair test of the efficiency of the circulation. At Yale I believe they consider 50 seconds the minimum time for determining efficiency. It is a simple thing to do. The individual doesn't have to be particularly primed for it and it is a little line of investigation that if there is any work on it that the authors of the paper have done I would be very interested in knowing their conclusions as to just the significance of the inability to hold the breath 35 seconds or whatever they figure they have determined.

Dr. MacKenzie—Mr. President and Gentlemen: It is quite difficult for me to express my regret that Dr. Frost is not with us this morning and I feel it was very fortunate, as well as most courteous, that the doctor was good enough to send me a copy of his paper so that it was possible in his absence for Dr. McCrudden to read it. I didn't ask to have that paper read, gentlemen, because he had some complimentary things to say about our test. The reason that I wanted it read was because of his own experience with his cardio-respiratory test. It struck me that those data were so encouraging that it would be of interest to you all and should be read.

Now, in the first place, Dr. Wilson referred to temporary impairments which clear up, and particularly to the question of weight. Undoubtedly an individual can improve his condition by the exercise of care. If he reduces his weight he will be a better risk than if he doesn't, but it seems to me that the probabilities of his reducing his weight, gentlemen, and keeping it down are

much less than that he will do it and that therefore any functional test which shows distinct impairment—it may be on account of simply overweight or because of some circulatory impairment—is of significance for us. We have to rate the man on his present weight, presuming that it is a real impairment, and if we can show good evidence by some distinctive test that he is really impaired, surely that test is of value.

The doctor referred to the length of time taken to do the test. We are perfectly willing to admit that the test does take some time. It takes 20 minutes and I have had some of our best examiners tell me that it really took them half an hour with the instruction that they had to give, because some applicants don't grasp the idea of the blow and don't become able to blow through the instrument as rapidly as do others. So occasionally it takes half an hour. That will disappear to some extent with greater experience on the part of the examiners.

We have been going through a process of evolution in the development of this test and we have put into your hands a test that has been developed since our paper was written, although it has been much discussed before that time. This test takes ten minutes, and if you subtract from that ten minutes the time taken in any insurance examination for taking the pulse and the blood pressure, you reduce it to about seven minutes. Now, gentlemen, if you are dealing with an application calling for $5,000, $10,000, $15,000 or $100,000, what is seven minutes more added to an examination in the application of a test, provided that that test is of real value in assisting us to estimate the value of the risk? If it helps us to take an applicant, that is in the applicant's favor and in the Company's favor also; if it is sufficiently definite to enable us to decline the applicant, surely that is in the Company's favor and we don't want the impaired risk. So while the time element, I believe, in any test is a real factor, I don't think that where considerable sums of insurance are involved a seven-minute or a ten-minute or even a twenty-minute test should be a very serious objection provided it gives the information, and we are inclined to think that it does. We have yet to have more

than one or two—I don't remember how many; do you remember, Dr. Wells, how many objections we have had?—the objections, I am sure, to the length of the test have been extremely few. (DR. WELLS—That's correct.) So our examiners have been willing to do this test for us without objection. And the objection on the part of the applicants has not been at all great. In other words, we have had no difficulty along that line.

Now you know that the physician—I think this has been mentioned in the Society a great many times, but I want to bring it out once more—the physician has a tremendous advantage over the insurance examiner, and if we can develop some test that will show up the applicant regardless of his history, I think we have gained a good deal. A man may have had an attack of acute inflammatory rheumatism, which is denied completely. He comes up for examination. There is no murmur. There is no apparent hypertrophy that an ordinary physical examination can determine, and his blood pressure is all right, but his heart muscle may be impaired. Now have we got a test that will show that impairment? That is the point. If it does show that impairment, gentlemen, it is a tremendous gain. That is why we feel favorably disposed to this test and to the New England Mutual test. We are both working along the same lines, gentlemen, one is using one type of instrument and the other is using another type of instrument—but it doesn't matter; the two tests are so very similar that we feel our results are telling practically the same story.

Dr. Wilson spoke of the ideal test and his belief that the ideal test should be short, that we should be able to express the results in figures, and that we should be able to check it. Well, I think I have spoken enough about the length of time taken. Our test can be expressed pretty well in figures, gentlemen. If you will study our charts and study our form, you will find that it is pretty nearly reduced to a mathematical proposition, so that we have accomplished that.

As to checking, there are any number of checks, as shown in the paper on this test, as many as nine in some instances, so you see we can check it and if there is something astray with it, we

can always go back and ask for a second examination in order to check it, so I feel that this test and the New England Mutual test pretty nearly meet Dr. Wilson's requirement in this respect.

Now we don't for one minute think that this test is purely a test of the myocardium. We do think that the myocardium is the chief factor involved, but not the only factor. There is the nervous system, there is the cardio-respiratory center, there is the arterial system and there is the venous system to deal with, and if you just start studying this test, gentlemen, and go into the physiology of it in dead earnestness and work something out of it you will be amazed how many ramifications it has. Just try to consider it in the light of the autonomic nervous system and the possibilities that there are for vasomotor effects.

We recognize fully, I think—I hope so—that there are many factors involved in this beside the myocardium, and that is the reason why I have been inclined to object to this new form that has been handed to you, because I don't think that we get as much information from the new form as the old, but its particular advantages are two: In the first place, it is short; in the second place it can be easily repeated if something seems wrong with the applicant and may I call your attention to this point in connection with that form, that the T20 has to be 25 seconds in length and the Tm has to be at least 40 seconds in length. If they are not either or both, we ask the doctor to repeat the test and the repetition of the test will take five minutes so that in all it would be fifteen minutes.

Dr. Bradshaw mentioned that he would like to know something about the significance of the inability to hold the breath. That we are trying to work out, gentlemen, and I don't feel that I would be quite rash enough today to state exactly what the significance of the inability to hold the breath is. It is certainly tied up, I believe, to a considerable extent, with the myocardium.

Now to get back to Dr. Frost's test and his splendid discussion of our paper and the very informative and reassuring data that he has given us showing his mortality. He refers to what we call the Te, that is, the shortening of the blow after exercise. Dr.

Frost brought that up last year. We were very glad he did, for he expressed our own opinion about the shortening of the blow. I think that the shortening of the blow immediately following exercise is important. I think the length of blow two minutes afterward is also important. In fact, gentlemen, the whole test seems to us, as we go on with it, to be centering more and more around Test 5 of the other form, which is Test 4 of the form in your hands, which has been somewhat elaborated over the old Test 5. You see we get the return of the pulse rate in Test 4. The length of the breath-holding we get immediately after the standardized exercise—and I can't express my feelings about the necessity of standardization sufficiently. I believe if we are going to get real results, something that we can bank on, we have got to have standardization, and there is no standardization in bending movements and there never will be gentlemen, for no two men will take the bending movements with quite the same degree of vigor. It is a more difficult test to perform than this exercise test and will not, in our judgment, give us as good results.

As to the vital capacity, Dr. Frost doesn't agree with us on vital capacity to the full. I have got a few figures here that may interest you in that connection. We took three groups, the standard cases, the rated cases and the rejected cases, on vital capacity, and this is interesting: 7.6 per cent. of our standard cases failed to reach the border line of 85 per cent. as shown by Myers or 92 as corrected for temperature on our flarimeter; 29, or 23.4 per cent. failed to reach that point in the rated cases; and 40.4 per cent. failed to reach it in the rejected cases—and the majority of those cases, gentlemen, were cases with cardiac, renal or some other circulatory impairment. So it does look to us as if vital capacity has a certain degree of selectivity in it, although we don't begin to place the confidence in vital capacity as a selective agent that we do in some other features of our test. But you will remember those things: Standard, 7.6; rated 23.4; rejected 40.4. The correlation is very great, isn't it?

Now Dr. Frost referred to hyperactivity and his greatest mortality is in the hyperactive cases. We believe that our greatest

mortality is going to correspond exactly with his. I mean in significance. If we get a short T20 and a Tm minus S plus, that is negative; in other words, if the time in seconds is less than the millimeters increase over the base line, we call that Tm minus S plus, negative; in other words Tm less than S plus shows a distinct degree of irritability and if you get a shortened T20 along with that, then you have got still further reason to feel that there is hyperirritability. So we believe that these two features that the test distinctly shows are unfavorable and it has shown up pretty well in our statistics, although we haven't got so many at the present time.

We referred to the handicaps that we have been under during the past year on account of the production.

I want to say one more thing about Dr. Frost's paper. We feel under a very deep obligation to Dr. Frost in this work because he has blazed the trail that we are trying to follow. If we can improve it, we'll be very glad; if we can't, we'll be glad to go along with him and do everything we can to assist in bringing this thing to a head; but it is remarkable to us—and Dr. Wells and I were talking about it last night—that he should have gotten a mortality within 1 point of the general mortality of his Company. Am I correct in that statement, Dr. Frost?

Dr. Frost—That's correct. I would like to discuss that in a moment, with your permission.

Dr. MacKenzie—I won't stop to look the figures up. Dr. Frost will mention it to you. It is remarkable to us that he should with these impaired risks have been successful in getting a mortality which so closely approached the mortality of his Company, and in that mortality is included many accidents, suicides, cancers and that sort of thing, so that if you eliminate the things that can't by any stretch of the imagination be attributed to the heart, his mortality would be a great deal smaller. If I am wrong in that statement he will no doubt correct me.

Now, gentlemen, there is a possibility of the length of blow being incorrect and I want to refer to that because I have got

two cases here that are interesting and I know that some misunderstanding has arisen because of the length of blow in what looked like impaired cases. Here is a case that Dr. Wells examined at Beth Israel Hospital. This lady was markedly dyspnoeic. She was in bed in an unfavorable condition. The doctor made this notation: "Could not get proper cooperation; did not understand the English language well; did not hold monometer level; not visible all the time so that we can not be sure that the blow was continuous; probably took short auxiliary breaths without being noticeable because of the extreme pressure variabilities." Now there is a possibility of taking short auxiliary breaths in that blow. The lady, in spite of her greatly impaired condition, blew 85 seconds. Do you believe she did? There are very few men in this room that can blow 85 seconds and they are all in presumably good health. But this lady, sick in bed, was successful in doing that.

I was interested in going over the reports of Dr. Schwartz of Cincinnati, who has been working with this test, but unfortunately, owing to a combination of circumstances, he was unable to get all the cases for us that we hoped last year he would, but he did send us 20 additional cases, and I may say that those 20 additional cases are right along the line of his other cases. But here is an outstanding one. Here is his comment: "On physical examination, patient is markedly dyspnoedic, etc." I won't read the whole report. Now this lady blew 52 seconds, gentlemen. If you based your interpretation of that test on the length of blow, I wouldn't blame anybody for supposing that the instrument should be in the scrap heap and that the test was no good, but, gentlemen, with the 52-second blow, her blood pressure only went up 10 mms and she didn't reach T20. In some way she succeeded in taking some extra breaths. How she did it, I don't know, but let me say this to any of you that happen to have a flarimeter: You have to keep your eye on that water and it has to be visible; in other words, you have got to see the water all the time. These fluctuations in the flarimeter are all right, gentlemen. We provided for that by using water instead of mer-

cury, so that the fluctuations in pressure would be magnified, but we didn't provide, and can't provide, so far as I now know, for a lady or gentlemen that would be good enough to try and grab a little breath and extend the blow—but it is shown up in the systolic pressure. There is no use trying to get a Tm minus S plus on this case because the blow is manifestly incorrect. It wasn't noticed on this case; it wasn't noticed by Dr. Wells until the lady took the 85-second blow, and then he caught it.

You will see that we are eliminating our old form in favor of this form, and may I say, gentlemen, we are not going to this form without consideration and trial. We are going to leave the old form in the hands of our examiners and do it sometimes ourselves and we are going to use this new form to see if one performance will give us as satisfactory results as the three blows did. You see the applicant is pretty well trained while he takes the vital capacity and that is one reason for retaining the vital capacity in the test. Another reason for retaining the vital capacity is that we think it is going to be of really more value than the chest measurements. Personally, I haven't much use for chest measurements. A man with good pectoral muscles can do almost anything with his chest measurement, but we do know that if his blow is all right he has got a good lung expansion—so we are going to try out this new form in the Home Office somewhat and among selected examiners in the field and perhaps next year be able to report to you as to the relative merits of the two forms.

Now, gentlemen, we are going to continue with this test and try and determine its value, and as far as getting the significance is concerned, we can only do that, we think, through mortality statistics, and many of you know a great deal better than I do that it takes time to collect sufficient data to establish a mortality that will be really informative so that you can bank on it and say the Tm minus S plus shows that that group of cases is impaired, or the T20 shows it is impaired, or the short blow, and so on.

I think perhaps I have said enough so I am going to stop. Thank you very much.

DR. MUHLBERG—Our next speaker, Dr. Carey P. McCord, of Cincinnati, is an Associate Professor in the Department of Bacteriology and Public Health of the University of Cincinnati, and Lecturer in Industrial Hygiene in the Engineering College of the University of Cincinnati. He is also Medical Director of the Industrial Health Conservancy Laboratories. He specializes in Public Health work in industry and in the medical investigation of problems related to health and industry. He has published some one hundred and fifty papers on these subjects and his researches have been commented on four or five timets in the editorials of the Journal of the American Medical Association.

You may perhaps have seen the Industry Reports which the Retail Credit Company publish. You will find that in most of these reports Dr. McCord has appended comments on the potential health hazard in connection with each one of the occupations investigated by the Retail Credit Company. By the way, some of these comments have been very instructive and interesting.

His major studies have been in connection with lead poisoning in industry, the toxicity of various refrigerants, the toxicity of benzol compounds and the investigation of special occupations, such as train dispatchers, on which he will comment in his address to us.

He, furthermore, has conducted the examinations of one thousand office workers in clerical positions, and one thousand skilled mechanics in the factories of Cincinnati, for the Cincinnati Heart Council. His paper before our Association will also deal with these studies. Much of the detail of his work is done by skilled physicians in his Conservancy Laboratory. He is frequently consulted by large corporations for a medical review of their special problems and, in my opinion, he has perhaps a wider knowledge of the relation of industry to medical problems than any expert in this country. His address to us I think will be particularly interesting, because it deals with the special problems that we so frequently encounter in our own work. Dr. McCord would have it clearly understood that he is not a heart specialist.

THE HEART PROBLEM OF THE WORKER

By Carey P. McCord, M. D.
of
The Industrial Health Conservancy Laboratories,
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The Heart Council of Cincinnati, under the leadership of its President, who is also your President, during the past two years has conducted clinical investigations as to cardiac conditions in various types of employment. Up to the present time three series of 1,000 each have been completed. The first of these was limited to male office workers (1); the second to male factory machine and hand tool operators (2); the third to male negro factory workers engaged in physical operations somewhat more arduous than the white factory workers (3). Statistical compilations are available only on the first two groups. To this lot of 2,000 carefully examined white males have been added 165 examinations of train dispatchers, made during the same period and by essentially the same personnel (4). We thus have for consideration the findings from one group of male workers in physical operations, with a minimum of mental stress and strain; a second group of essentially sedentary workers without physical loads, but with a larger, but not remarkable, mental stress and strain; and a third and smaller group of sedentary workers without physical work activities, but characterized by a degree of continuous mental stress and strain probably not exceeded by any extensive group of workers in this country. Before entering upon a presentation of the noteworthy differences in findings, it is necessary to provide some additional general information as to the nature and scope of the examinations.

GENERAL PRINCIPLES AND METHODS GOVERNING EXAMINATIONS.

A frequent unfavorable criticism of the reports on the physical status of large numbers of persons is based on the fact that numerous physicians participated in the examinations, and thus, necessarily, introduce inescapable variables in technique and interpretation. To the recent admirable compilation by Sydenstricker and Britten (5), data was contributed to the basis materials analyzed by approximately 9,000 practicing physicians. In order to overcome this somewhat nullifying process, in our series, all save one block of 100 cardio-vascular examinations (Roentgen examinations excepted) have been made by one physician under highly standardized procedures. All examinees were obtained on a volunteer basis from the specified industrial classifications, after careful efforts to acquaint the prospective examinee of lack of bearing of the findings on employment, publicity, insurance, or insistence on relief measures. A greater freedom of mind was sought than that commonly obtaining in army, employment, or insurance examinations. Persons under medical care were rejected. An extensive social, work and medical history was obtained and recorded. In one series, these preliminary steps included mental testing, an inventory of the psychologic state, word association tests, etc. This phase of the inquiry was followed by items such as weight, height, vision, dentition, orthopedic conditions, skin, etc. Lastly, examinations embraced the viscera of the chest and abdomen. No undue emphasis was placed on the cardio-vascular testings, although such were far more thorough than carried out on such organs as the prostate. Special examinations, such as Wassermann tests, Roentgen examinations, blood sedimentation tests, were performed as indicated and as cooperation was procurable. Urinalyses constituted an item in routine procedure. After actual examinations, the physician recorded a summary of significant deviations from the normal. Following this, all records were scored, irrespec-

tive of the examiner's impressions, in terms of precreated standards for ten age groups. Lastly, compilation data were obtained through the use of the statistical machines of the International Business Machines Corporation, with some consideration for probable errors and loadings. The per capita time consumption was in one series ten hours, and in two series two hours and twenty minutes. The time in contact with the examinee was in one series four hours, and in two series one hour.

FINDINGS IN THE CARDIO-VASCULAR SYSTEMS

In these compilations caution has been regarded as a requisite, and has been fully exercised in avoiding rigid diagnoses of such conditions as "myocarditis", "aortitis", "valvular heart disease", etc. Wherever such terminology has been applied, the conditions have been clear cut and the totals represent only a low percentage of possible lesser degrees of these abnormalities. The prime purpose in this study has been to detect significant deviations from the normal and encroachments upon the cardio-vascular reserves. Although we have excluded from significance such items as extra-systoles, sinus arhythmias, irregularities in rates, some tachycardias, minor arterio-sclerosis, and trivial or questionable hypertrophies, we regard all of these manifestations as warnings of possible incipient stages of significant abnormality.

In the following tables and charts we have abridged the more important cardio-vascular findings and correlations found in eighty tables in the basic reports on which this report is based.

COMMENT ON STATISTICAL COMPLICATIONS

The facts shown in the preceding tables have yielded incidence rates for cardio-vascular conditions apparently in excess of the findings from some other studies. Unfortunately, it is impossible to make just comparisons on a

basis of parity between the several major investigations of the physical status of supposedly well persons. Frequently, this situation is due to the failure of the examiners to classify findings on the basis of age groupings, which, obviously, sharply limits their value. The reports of Sydenstricker and Britten (5) are based on analyses of a selected group of males embracing only about 1.3 per cent. of workers on the social and economic level (train dispatchers excepted) represented in the present study. The depiction of defects found among army draftees by Love and Davenport (6) is necessarily limited to restricted and youthful age periods. The ten thousand industrial workers making up the sample analyzed by Britten and Thompson (7) include approximately 70 percent of persons of foreign birth or negroes. Such variables as these, while in no wise reflecting upon the merits of the compilations, tend to limit comparisons on any basis of equality of samples. Therefore, it may develop that our rates for cardio-vascular abnormalities are not out of proportion to other examinations made under identical circumstances.

If, in fact, our results indicate a greater frequency of cardio-vascular deviation from the normal, explanation may be found in our attachment of importance to cardiac enlargement, even in moderate degree, as evidence of taxation of the cardiac reserve. Of this, Stroud (8) states:—"The truest estimate of the extent of the encroachment upon the myocardial reserve is to be gained from a determination of the extent of the enlargement of the heart." Earlier he states: "_____it is impossible to over-emphasize the importance of a correct estimation of the myocardial reserve, for it is mainly upon this that satisfactory prognosis and treatment depend. _____" Again, "_____In reviewing the literature of fifteen or twenty years ago, one cannot but be impressed with the importance then placed upon murmurs, and the intensity or character of the cardiac sounds in prognosticating the future of a diseased heart. Even today, the

average student, be he graduate or undergraduate, upon visiting a heart clinic seems most interested in listening to, and in discussing, the character and importance of murmurs....." "Certainly murmurs are of importance, and their depreciation is being overdone by many clinicians, but an attempt should be made to seek the middle ground and give them their relative importance as in estimating that which most of all we wish to know—the myocardial reserve."

Perusal of the three basic reports, upon which this special report is formed, will reveal in that group (factory workers), in which cardio-vascular abnormality is least, the highest incidence of grossly bad oral conditions, infected tonsils, dermatoses, and joint conditions suggestive of infection. In some measure offsetting this state of affairs, it may be maintained that among clerical workers there has been a certain amount of self selection of easier jobs. This, however, does not apply to train dispatchers, in which group cardio-vascular impairments reached amazing numbers, for these men are selected by railroad officials from telegraphers and towermen on the basis of durable and rugged qualifications.

Excessive weights, long known to the insurance world as a salient factor in the abetment of cardio-vascular disease, has contributed to the excessive rates observed in both office workers and train dispatchers. Obesity does not characterize the factory worker.

In the office workers, and in the factory workers, the youthful and underweight examinee was prone to present hypotension. While certain degrees of low blood pressure are rated as significant cardio-vascular deviations, we do not, on a quantity basis, accept this condition as on a parity with essential hypertension. In late decades, hypotension has been frequently observed.

In the graphs prepared for the three basic studies, there recurs, with remarkable frequency in the decade from 55 to 65 years of life, a decided notch in otherwise ascending curves. Recognizing that our samples are truly small when

subdivided on a basis of age and notably in late life, this deviation in trends was early accepted as accidental. When, however, this same betterment reappeared in the other groups in the same life periods, we attached greater significance. Further inquiry may show that through an elimination process due to deaths, survivors near 65 years are physically superior to the total group near 55 years of age.

Some significance has been attached by cardiologists to the duration of breath holding time as an index of cardio-vascular abnormality. It has been stated that those persons unable to stop breathing for as much as 35 seconds should be examined with additional care for abnormality in this field. In one series of 1,000 examinees, it was noted that only 63 per cent. of the total group held their breath for 35 seconds, or longer, upon request; and that 50 per cent. of all persons rated as having cardio-vascular abnormality were in this group. The inference is that breath holding time with this standard does not afford helpful information as to cardio-vascular dysfunction.

In this work the pulse pressure of 50 mm. or more, has been rated as of probable pathological significance. Using this standard, 28.8 per cent. of the 1,000 factory workers presented this deviation, while 58.7 percent of the train dispatcher group exhibited this abnormality.

Among train dispatchers, 85.3 per cent. presented heart rates in excess of 80. Heart rates at the end of the work period were consistently normal for all persons, and for those individuals examined before and after work.

Findings from urinalyses have not proven of outstanding worth in connection with the detection of cardio-vascular disease, although among train dispatchers, the group in which cardio-vascular abnormality is outstanding, definite urinary findings of positive character have likewise been highest.

Reference to maps of this country, showing by states the relative mortality rates from heart disease, will establish

that with few exceptions all our examinations have been made in that zone providing the highest death rates from this cause (above 180 per 100,000). With the exception of certain New England States, this zone is characterized by greater density of population. Urban death rates (1914-1923) (9) for the registration area were 201 per 100,000 of population, in contrast to 153 for the same population unit for rural communities.

CAUSATIVE FACTORS IN INCREASING RATES OF CARDIO-VASCULAR ABNORMALITIES

Work, as a source of organic heart and blood vessel lesions, has been relegated by the cardiologists to a minor role. Likewise, the industrial physician and hygienist has been unable to produce, in the majority of industries, any acceptable evidence of appreciably higher rates of frequency, when full consideration is given to racial, social and economic influences. Wade Wright (10) has cited the report of the Registrar General of England and Wales for 1921-1923, as indicating that of 164 occupational classifications of males dying between the ages of twenty and sixty-five, only 16 classes presented significant standardized mortality rates, in excess of all occupied and retired males, for valvular heart disease, and only 21 classes for "Other Diseases of the Heart". Exceptions to this general situation are to be found in such occupations as involve exposure to siliceous dusts, lead compounds, and other specific intoxicants.

The concept that work is not a producer of heart and blood vessel degeneration is almost entirely linked up with excessive muscular work on a foot pound basis, such as may arise in the ditch digger, the boiler maker, the football player, or the Olympic runner. It is granted that scant proof exists that such work leads to cardio-vascular harm. On the other hand, there are forms of work, as well as other aspects of human life, that lead to continual trauma or indignities to the autonomic nervous system, that so influence the functions of visceral tissues as to culminate in organic

changes. It is the thesis of this paper that the cardio-vascular system may be organically involved in this process. As some evidence, we cite the nature and quantity of work of train dispatchers, together with the organic changes demonstrable in varied organs, notably the cardio-vascular system. The train dispatcher occupies the spearhead position in all train movements. He, at his desk, is responsible for all orders relative to freight, passenger and work trains. He it is that carries the burden of safety of the traveling public and train crews against catastrophes. In addition, he is responsible for the legal enforcement of hours of labor of crews, for watering of animals, and for such multitudinous duties as to tonnage, engine types, freight pickup, standard time, relief for wrecks, and replacement of damaged equipment. Some idea of the taxation of the train dispatcher's capacities may be grasped in pointing out that as he sits at his desk with phone receiver over his ear or sounder near-by, as many as two hundred items per hour come to him for record or decision. Many, but not all of these items, involve the life or death of human beings. Decisions in such matters must be made in terms of seconds in the midst of other and diverting matters in a work room at times so noisy as to constitute a din. Under frequent, but by no means regular conditions, the train dispatcher, during his entire eight-hour work trick, may not leave his desk or remove his ear phone receiver.

As a result of these things, the train dispatcher presents a sixty-seven percent incidence of occupational nystagmus, a fifty-two percent of occupational deafness, largely in his phone ear—the left, a high incidence of telegrapher's paralysis among older men who formerly operated by the Morse system, and among a smaller number who still so function. In this city (New York) 65% of 44 train dispatchers exhibited albuminuria in some degree. To these conditions add the findings already presented as to cardio-vascular abnormality, in which hypertension and cardiac enlargement

play significant parts. In addition to these organic manifestations, train dispatchers present neuroses and neurotic symptoms, such as intention tremors, blepharospasm, tachycardia, vasomotor disturbances, hyperhidrosis, functional gastric impairments, frequent urination, breathlessness and anxiety.

The average train dispatcher enters upon his duties, relatively, late in life, near 32 years of age, and on the basis of 442 deaths in the past 12 years, lies dead at the average age of 50.17 years.

Having ruled out any high prevalence of syphilis through Wassermann Tests on 44 consecutive train dispatchers examined, and by careful clinical observations, and having ruled out a higher frequency of other infections than may be expected to obtain in all males of comparable age, social, and economic status by careful history taking and clinical observations, we are prompted to believe, from all our findings, that portions of this unusual extent of organic cardiovascular abnormality are the results of prolonged, overwhelming mental strain.—IN SHORT ORGANIC IMPAIRMENT FROM MENTAL TRAUMA.

This concept of the source of certain instances of cardiovascular disease is not wholly new, and is detectable in the trend of recent and contemporary opinion. Dublin (11) states:— "The nervous mechanism which regulates the heart action may be temporarily and slightly deranged, producing heart symptoms without causing structural changes in the heart. Emotional states and severe bodily exercise will increase the demands on the circulation and overstrain the heart. The symptoms in such cases are sometimes very distressing, but usually are of no very great importance. If they are allowed to continue for long periods of time, however, these functional disorders may result in permanent heart impairment." Greiwe (12) states:— "It is evident that no true concept can ever be gained of the question of blood pressure and hypertension unless one acquaints him-

self with the autonomic nervous system ——". Later he states:— "—— When we come to consider the pathological anatomy associated with states of hypertension, we may say that in that type which is known as essential hypertension, we are at first dealing with what we are justified today in calling a neurosis, for the reason that no definite anatomic changes can be detected until the disease has existed for some years ——."

Krogh (13) estimates that the total surface of capillaries within muscle tissues alone approximates 69,000 square yards, and that the total length of capillaries again in muscle walls approximates 60,000 miles. If to these astonishing figures there be added corresponding ones for all other tissues, it must be granted that a tremendous lake or reservoir exists in all parts of the body. It is unlikely that more than 10 per cent. of capillaries in muscles are filled at any one time, but under the influence of various types of autonomic stimuli, there takes place a surge from essentially complete filling to relative emptiness. There can be no warranted doubt that such a situation, which is presented only as an example of several, has an important bearing on immediate blood pressure resulting in ultimate organic changes. Further it is difficult to believe that these changes in capillaries limit their influence to concomitant changes in blood pressure. The heart, the larger arteries, the veins, and the capillaries are all interdependent, and share in the results of whatever stimuli reach any one portion.

From the field of psychology there is coming much evidence in support of clinical significance of the autonomic nervous system defection. Industrial fatigue, long associated with the muscular system, is shifting to the autonomic and central nervous systems. More fatigue may be caused a workman in ten seconds if his machine explodes, than would be caused by 24 hours steady work at the machine under normal, heavy, muscular work.

Christian (14) relates that in his clinic 61 percent of all cardiac patients present chronic non-valvular heart disease, without a history of rheumatic fever, and without frequency of syphilitic history of importance. In these conditions he continues—"Usually there is cardiac hypertrophy and dilation, rarely an interstitial (fibrous) myocarditis ——. Microscopically, there may be evidences of degenerative changes in the muscle fibers, but in the majority of cases the microscope reveals no change other than hypertrophy of the fibers." Cloetta (15) indicates a shift in his position when he voices the following:— "——Contrary to the former conception, I now consider every heart with dilation and hypertrophy as in an abnormal state and of diminished efficiency ——." Recently the term "myocardosis" has come into being (Reisman (16) Hyman and Parsonnet (17)), as descriptive of non-inflammatory varieties of heart disorders. The psychic factors in cardiac disorders form the basis of a recent publication by Conner (18).

Behind these contemporary publications indicative of a modification of the present day beliefs as to the etiologic factors of cardio-vascular abnormalities, stands the classical investigative work in the field of the autonomic nervous system of Cannon, Eppinger, Mueller, Krogh, and of others. To them a full measure of praise is due.

In contending that long continued abnormal stimulation of the exceedingly responsive autonomic nervous system may eventuate in visceral organic changes, it is desirable that I point out that while The Heart Council of Cincinnati has sponsored this work, that body may not concur in my interpretation of etiologic factors. If, however, from this paper and others that precede and may follow there may be an acceptation of the concept of organic changes resulting from long sustained and numerous emotional reflex stimuli, we then possess an adequate explanation of increasing numbers of bodily dysfunctions in which cardio-vascular lesions are now playing a disturbing part.

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TABLE I. SIGNIFICANT CARDIO-VASCULAR ABNORMALITIES.

Age Group	Examinees with Significant Deviations from Normal			Percent of Total Examined			Total in Group		
	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25	8	14	0	19.5	15.9	0	41	88	0
25–29	12	26	3	16.4	13.1	100.0	73	199	3
30–34	29	45	6	24.0	24.6	60.0	121	183	10
35–39	48	50	18	21.9	28.4	75.0	219	176	24
40–44	52	43	32	33.8	34.1	76.2	154	126	42
45–49	53	30	28	41.1	41.7	93.3	129	72	30
50–54	55	44	21	52.4	60.3	84.0	105	73	25
55–59	55	24	14	66.3	57.1	87.5	83	42	15
60–64	30	17	10	62.5	80.9	91.0	48	21	11
65–+	19	17	3	70.4	85.0	75.0	27	20	4
Total	361	310	135	36.1	31.0	81.8	1000	1000	165

TABLE II. SIGNIFICANT CARDIAC HYPERTROPHY.

Age Group	Examinees with Significant Cardiac Hypertrophy			Percent of Total Examined			Total in Group		
	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25	1	1	0	2.4	1.1	0	41	88	0
25–29	1	4	2	1.4	2.0	66.7	73	199	3
30–34	3	4	2	2.5	2.2	20.0	121	183	10
35–39	11	8	7	5.0	4.5	29.2	219	176	24
40–44	11	11	14	7.1	8.7	33.3	154	126	42
45–49	11	9	17	8.5	12.5	56.7	129	72	30
50–54	27	14	11	25.7	19.2	44.0	105	73	25
55–59	30	8	3	36.1	19.1	18.7	83	42	16
60–64	17	8	5	35.4	38.1	45.4	48	21	11
65–+	10	8	1	37.0	40.0	25.0	27	20	4
Total	122	75	62	12.2	7.5	37.6	1000	1000	165

TABLE III. HYPERTENSION.

	Examinees with Hypertension			Percent of Total Examined			Total with Significant Heart Lesions			Percent of Total Examined			Percent of Total c Significant Heart Lesion having Hypertension			Total in Group		
Age Group	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25-	1	4	0	2.4	4.5	0	8	14	0	19.5	15.9	0	12.5	28.6	0	44	88	0
25-29	2	10	1	2.7	5.0	33.3	12	26	3	16.4	13.1	10.0	16.6	38.6	33.3	73	199	3
30-34	3	7	1	2.5	3.8	10.0	29	45	6	24.0	24.6	60.0	10.3	15.6	16.7	121	183	10
35-39	14	7	4	6.4	3.6	16.7	48	50	18	21.9	28.4	75.0	29.2	14.0	22.2	219	176	24
40-44	16	10	8	10.4	7.9	19.0	52	43	32	33.8	34.1	76.2	30.7	23.2	25.0	154	126	42
45-49	27	11	13	20.9	15.3	4.3	53	30	28	41.1	41.7	93.3	50.9	36.7	46.4	129	72	30
50-54	20	20	9	19.0	27.4	36.0	55	44	21	52.4	60.3	84.0	36.4	45.5	42.8	105	73	25
55-59	24	10	6	26.5	24.8	37.5	55	24	14	66.3	57.1	87.5	40.0	41.6	42.8	83	42	16
60-64	13	5	6	27.1	23.8	54.5	30	17	10	62.5	80.9	91.0	43.3	29.4	60.0	48	21	11
65-+	11	7	1	40.7	35.0	25.0	19	17	3	70.4	85.0	75.0	57.9	41.2	33.3	27	20	4
Total	131	91	49	13.1	9.1	(29.7)	361	310	135	36.1	31.0	81.8	35.7	29.4	36.3	1000	1000	165

TABLE IV. HYPOTENSION.

	Examinees with Hypotension			Percent of Total Examined			Total with Significant Heart Lesions			Percent of Total Examined			Percent of Total e Significant Heart Lesion having Hypotension			Total in Group		
Age Group	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25-	5	5	0	12.2	5.7	0	8	14	0	19.5	15.9	0	62.5	35.7	0	41	88	0
25-29	3	9	0	4.1	4.5	0	12	26	3	16.4	13.1	100.	25.0	34.6	0	73	198	3
30-34	18	26	2	14.8	14.2	20.0	29	45	6	24.0	24.6	60.0	62.0	57.8	33.3	121	183	10
35-39	23	25	1	10.5	14.2	4.2	48	50	18	21.9	28.4	75.0	47.9	50.0	5.6	219	176	24
40-44	22	25	4	14.3	19.8	9.5	52	43	32	33.8	34.1	76.2	42.3	58.1	12.5	154	126	42
45-49	16	5	3	12.4	6.9	10.0	53	30	28	41.1	41.7	93.3	30.1	16.6	10.7	129	72	30
50-54	20	13	1	19.0	17.8	4.0	55	44	21	52.4	60.3	84.0	36.3	29.5	4.7	105	73	25
55-59	13	7	4	15.6	16.7	25.0	55	24	14	66.3	57.1	87.5	23.6	29.1	28.5	83	42	16
60-64	4	4	0	8.3	19.0	0	30	17	10	62.5	80.9	91.0	13.3	23.5	0	48	21	11
65-+	0	4	0	0.0	20.0	0	19	17	3	70.4	85.0	75.0	0.0	23.5	0	27	20	4
Total	124	123	15	12.4	12.3	9.1	361	310	135	36.1	31.0	81.8	34.3	39.7	11.1	1000	1000	165

TABLE V. PULSE PRESSURES.

Age Group	Examinees with pulse pressure of less than 30 mm.			Examinees with pulse pressure of 30–49 mm.			Examinees with pulse pressure of 50 or more mm.			Total in Group		
	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25	..	1	0	..	57	0	..	30	0	..	88	0
25–29	..	5	0	..	150	1	..	44	2	..	199	3
30–34	..	5	1	..	144	1	..	34	2	..	183	4
35–39	..	5	1	..	134	9	..	37	7	..	176	17
40–44	..	4	2	..	91	12	..	31	18	..	126	32
45–49	..	1	0	..	45	11	..	26	14	..	72	25
50–54	..	3	0	..	36	4	..	34	15	..	73	19
55–59	..	1	1	..	12	4	..	29	5	..	42	10
60–64	..	0	0	..	8	1	..	13	6	..	21	7
65–+	..	0	0	..	10	2	..	10	2	..	20	4
Total	..	25	5	..	687	45	..	288	71	..	1000	121
Percent	..	2.5	4.1	..	68.7	47.1	..	28.8	58.6	..		

TABLE VI. VALVULAR LESIONS*.

Age Group	Examinees with Valvular Lesions			Percent of Total Examined			Total with Significant Heart Lesions			Percent of Total Examined			Percent of Total c Significant Heart Lesions having Valvular Lesions			Total in Group		
	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25	1	2	0	2.4	2.3	0	8	14	0	19.5	15.9	0	12.5	14.3	0	41	88	0
25-29	4	3	1	5.5	1.5	33.3	12	26	3	16.4	13.1	100.	33.3	11.5	33.3	73	198	3
30-34	5	4	3	4.1	2.1	30.0	29	45	6	24.0	24.6	60.0	17.2	8.9	50.0	121	183	10
35-39	6	5	5	2.7	2.8	20.8	48	50	18	21 9	28.4	75.0	12.5	10.0	27.8	219	176	24
40-44	6	0	11	3.9	0	26.2	52	43	32	33.8	34.1	76.2	11.5	0	34.4	154	126	42
45-49	6	3	11	4.7	4.2	36.7	53	30	28	41.1	41.7	93.3	11.3	10.0	39.3	129	72	30
50-54	7	1	6	6.6	1.4	24.0	55	44	21	52.4	60.3	84.0	12.7	2.3	28.5	105	73	25
55-59	6	0	5	7.2	0	31.2	55	24	14	66.3	57.1	87.5	10.9	0	35.7	83	42	16
60-64	3	4	6	6.2	19.0	54.5	30	17	10	62.5	80.9	91.0	10.0	23.5	60.0	48	21	11
65-+	6	1	1	22.2	5.0	25.0	19	17	3	70.4	85.0	75.0	31.6	5.8	33.3	27	20	4
Total	50	23	49	5.0	2.3	(29.6)	361	310	135	36.1	31.0	81.8	13.8	7.4	36.2	1000	1000	165

*Possibly includes some functional murmurs.

TABLE VII. SIGNIFICANT HEART LESIONS IN RELATION TO OVERWEIGHT.

	Examinees with Significant Heart Lesions			Percent of Total Examined			Examinees with Overweight			Examinees with Overweight having Significant Heart Lesions			Percent of All Significant Heart Lesions			Total in Group		
Age Group	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25	8	14	0	19.5	15.9	0	4	6	0	1	0	0	12.5	0	0	41	88	0
25-29	12	26	3	16.4	13.1	100.	13	43	1	2	6	1	16.6	23.0	33.3	73	199	3
30-34	29	45	6	23.9	24.5	60.0	24	42	4	5	10	0	17.2	22.2	0	121	183	10
35-39	48	50	18	21.9	28.4	75.0	84	61	10	23	19	6	47.9	38.0	33.3	219	176	24
40-44	52	43	32	33.7	34.1	76.1	65	54	21	20	22	12	38.4	51.1	37.5	154	126	42
45-49	58	30	28	41.0	41.1	93.3	67	40	14	26	21	12	49.0	70.0	42.1	129	72	30
50-54	55	44	21	52.3	61.1	84.0	70	48	15	37	31	10	67.2	70.4	47.6	105	73	25
55-59	55	24	14	66.2	57.1	87.5	55	30	10	37	17	5	67.2	70.8	35.7	83	42	16
60-64	30	17	10	62.5	80.9	90.9	25	13	8	18	10	4	60.0	58.8	40.0	48	21	11
65-+	19	17	3	70.3	85.0	75.0	15	9	2	14	8	1	73.6	47.0	33.3	27	20	4
Total	361	310	135	36.1	31.0	81.8	422	346	85	183	144	51	50.6	46.4	37.7	1000	1000	165

TABLE VIII. HISTORY OF PAST ILLNESSES.

	No History			Tuberculosis			Scarlet Fever			Malaria			Rheumatism			Venereal		
Age Group	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25	1	6	0	1	1	0	7	10	0	2	1	0	5	7	0	6	14	0
25-29	4	7	0	2	0	0	6	21	0	1	15	0	7	14	1	4	33	1
30-34	2	6	0	3	2	0	20	16	2	9	2	3	18	16	1	9	31	1
35-39	3	8	0	5	6	0	20	16	3	26	13	4	45	18	3	43	19	9
40-44	3	12	2	5	1	2	34	11	4	19	10	5	36	9	8	33	18	6
45-49	3	5	0	3	1	2	19	2	4	14	13	8	42	6	7	24	14	5
50-54	4	5	0	1	2	0	16	3	4	12	6	5	37	7	4	31	12	3
55-59	1	1	0	2	0	0	18	5	1	15	6	4	40	4	1	26	6	2
60-64	2	2	0	1	1	0	6	1	2	12	5	4	19	5	1	15	6	1
65-+	3	3	0	0	0	0	4	0	0	4	3	1	13	2	0	8	0	4
Total	26	55	2	23	14	4	150	85	20	121	74	34	262	88	26	199	153	32

TABLE VIII—(continued).

Diphtheria			Typhoid Fever			Tonsillitis			Neuritis			Nervous Brk.			Migraine		
Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
6	4	0	3	7	0	17	24	0		2		0	1	0	10	0	0
7	19	0	9	16	2	31	71	2		7		1	3	0	17	1	0
13	10	0	17	24	0	56	55	1		7		9	2	0	27	0	0
14	7	0	49	23	2	94	36	3		8		13	5	1	55	1	1
25	17	2	30	23	10	51	26	10		9		11	6	7	30	1	8
16	6	4	26	19	9	40	13	9		9		9	3	3	18	0	3
13	6	1	25	16	3	41	14	5		5		13	3	1	27	0	2
11	3	1	23	16	0	28	3	3		5		8	6	1	23	1	2
6	0	1	11	5	1	13	4	1		3		6	2	0	7	1	2
0	0	0	2	2	1	4	1	1		2		4	0	1	8	0	0
111	72	9	195	141	28	375	247	35		57		74	31	14	222	5	18

TABLE VIII—(continued).

Pneumonia			Measles			Whooping Cough			Influenza			Occup. Disease			Others		
Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
4	13	0	32	67	0	22	53	0	9	44	0	0	0		31	62	0
6	26	2	50	158	2	36	96	2	14	102	0	0	0		68	130	4
12	28	0	90	143	4	57	98	3	27	74	2	0	1		122	121	11
25	20	4	169	136	13	105	89	11	48	89	1	1	0		225	107	29
21	16	4	128	86	25	75	52	20	29	56	7	1	0		149	71	52
17	11	5	4	51	23	64	27	15	26	26	4	0	0		128	40	39
15	3	3	67	46	16	51	31	11	23	25	1	0	1		103	45	29
7	7	2	65	30	9	38	16	6	17	17	1	1	0		80	22	18
5	1	2	26	14	5	18	12	3	5	6	0	2	0		42	10	9
1	2	0	13	10	3	9	6	3	4	6	1	2	0		20	10	8
113	127	22	644	741	100	475	480	74	202	445	17	7	2		968	618	199

TABLE IX. SIGNIFICANT HEART LESIONS IN RELATION TO HISTORY OF RHEUMATISM AND TONSILLITIS.

	Examinees with Significant Heart Lesions		Percent of Total Examined		Examinees with Significant Heart Lesions and History of Rheumatism		Percent of Total Examined		Examinees with Significant Heart Lesions and History of Tonsillitis		Percent of Total Examined		Total in Group	
Age Group	Off. Wks.	Fac. Wks.	Off. Wks.	Fac. Wks.	Off. Wks.	Fac. Wks.	Off. Wks.	Fac. Wks.	Off. Wks.	Fac. Wks.	Off. Wks.	Fac. Wks.	Off. Wks.	Fac. Wks.
Below 25-	8	14	19.5	15.9	2	1	4.9	1.1	2	3	4.9	3.4	41	88
25-29	12	26	16.4	13.1	2	5	2.7	2.5	5	11	6.8	5.5	73	199
30-34	29	45	24.0	24.6	2	6	1.6	3.3	18	14	14.9	7.7	121	183
35-39	48	50	21.9	28.4	14	6	6.4	3.4	19	9	8.6	5.1	219	176
40-44	52	43	33.8	34.1	11	2	7.1	1.6	12	7	7.8	5.6	154	126
45-49	53	30	41.1	41.7	23	3	17.8	4.2	15	5	11.6	6.9	129	72
50-54	55	44	52.4	60.3	20	4	19.0	5.4	25	8	23.8	10.9	105	73
55-59	55	24	66.3	57.1	26	3	31.3	7.1	18	2	21.7	4.7	83	42
60-64	30	17	62.5	80.9	10	5	20.8	23.8	9	4	18.8	19.0	48	21
65-+	19	17	70.4	85.0	8	2	29.6	10.0	3	1	11.1	5.0	27	20
Total	361	310	36.1	31.0	118	37	11.8	(3.7)	126	64	12.6	6.4	1000	1000

TABLE X. GENERAL MENTAL SUMMARY*.

Age Group	Examinees with Normal Mental Status — Dispatchers	Percent of Total Examined	Examinees with slight Deviations from Normal Mental Status — Dispatchers	Percent of Total Examined	Examinees with significant Deviations from Normal Mental Status — Dispatchers	Percent of Total Examined	Total in Group — Dispatcher
Below 25	0	0.0	0	0.0	0	0.0	0
25–29	1	33.3	1	33.3	1	33.3	3
30–34	1	25.0	3	75.0	0	0.0	4
35–39	4	23.5	7	41.1	6	35.2	17
40–44	10	31.2	16	50.0	6	18.7	32
45–49	8	32.0	8	32.0	9	36.0	25
50–54	6	31.5	10	52.6	3	15.7	19
55–59	5	50.0	4	40.0	1	10.0	10
60–64	5	71.4	1	14.2	1	14.2	7
65–+	2	50.0	1	25.0	1	25.0	4
Total	42	34.7	51	42.2	28	23.2	121

*Based on psychiatric and neurologic examinations, together with results from Otis Mental Test, Laird Mental Inventory, Word Association Tests, and history of mental or nervous abnormality.

DR. COOK—The first two papers on our program this year direct our attention to the most important underwriting problem now confronting us—a better understanding and evaluation of the probable ability of the applicant's heart muscle to function during the subsequent years of his normal life expectancy. We are therefore now frankly facing the problem which MacKenzie stressed more than a quarter of a century ago—heart muscle sufficiency rather than valvular sufficiency. Up to this time our cardiac statistical and underwriting papers have concerned themselves with valvular disease and heart murmurs, and we have given but scant attention to the forms of heart disease which are responsible for much the larger percentage of our losses, especially in the case of the larger policies—disease of the heart muscle, hypertrophy, fibroid changes, and thrombosis from coronary sclerosis.

During the present century there has been a marked decrease in the incidence of acute articular rheumatism—most marked in the first decade, but, as shown in the August Statistical Bulletin of the Metropolitan Life, continuing the downward trend through 1929. As might be expected from the decrease in acute articular rheumatism, there has been a coincident decrease in deaths from valvular heart disease over the same period. Most of these rheumatic heart deaths are before 45 years of age.

Certainly during the three decades of the present century there has been no decrease, but an acceleration of the strain, speed, and cares of modern life, the factors which are being given more and more emphasis as predominant in the etiology of adult cardio-vascular-renal disease. I feel that Dr. McCord has done us a signal service in so clearly bringing to our attention a major factor—nervous strain—in the causation of the largest single mortality factor in insurance experience—cardio-vascular disease. The experience he gives with railroad telegraphers is an excellent illustration, as this occupation typifies modern scientific accomplishment with its coincident extreme nervous strain for the human element involved. A similar illustration could have been made with locomotive engineers, and also I doubt not with

members of the New York Stock Exchange, bankers, railroad presidents, and industrial and professional leaders who have borne the brunt of the accumulating responsibilities of the past decades of business over-expansion and the present resulting depression.

Railroad telegraphers and engineers make an insignificant factor in insured mortality, but the other group—business executives—make a most vital class and the strain of modern life is here far greater. Compare the nervous strain of an engineer with that of the president of a road like the Southern, where an increased dividend was talked of last year with the stock selling at 154, which is today selling at 70 and earning below present dividend requirements; not to mention cases of stock speculation, automobile agencies, etc., where the entire accumulation of years has been swept away.

In laying emphasis upon nervous strain as a major cause of adult cardio-vascular disease, Dr. McCord has incidentally directed our much needed attention to a real causative factor and away from the mistaken factors which have too exclusively occupied our consideration: "auto-intoxication," constipation, and various foci of infection—teeth, tonsils, etc. Many serious losses have been suffered by insurance companies because we have been too credulous about these cures of cardio-vascular disease. Too frequently we have accepted a man who has had a past record of cardiac symptoms or hypertension because of the therapeutic enthusiasm of some practitioner or cardiologist who has effected a cure by removal of an abscessed tooth, by a tonsillectomy, or some other method of treatment. Unfortunately, a month or a year or so afterward the cardiac symptoms recur or the blood pressure is as high or higher than before, unless the lower pressure was in fact due to a failing myocardium, which is not infrequently mistaken for a real improvement. I am extremely skeptical of the case which now shows a normal or only slightly elevated blood pressure after years of hypertension.

The time has come, I believe, when we should make a more determined effort to detect beginning cardio-vascular disease,

especially in applicants for larger amounts at ages 45 and over, and not continue to place undue reliance on absence of murmurs, for murmurs—except the soft oft-labeled "functional" systolic murmur at apex—are the exception in the more serious cardio-vascular cases. Heretofore our only reliable guide has been blood pressure, and I agree with Dr. Fisher that is our most important finding, but although a considerable proportion of these cases do have hypertension, many do not, or only a moderate hypertension which is incorrectly considered "normal for his age." As we consider these cases more carefully I believe we shall come to recognize much lower blood pressures as of real significance, i.e. 140 systolic and 92 diastolic. Such pressures, though they may be common at age 50, are not normal, as Dr. Hunter has shown, and are frequently associated with serious disease—angina pectoris, coronary sclerosis, etc.

During the past five years many companies have more and more frequently used the X-ray and the electrocardiograph. Their use must become more common if we are to recognize the seriously crippled cardiac who, when he first begins to have precordial distress and is warned by his physician, coincidentally realizes his need for large life protection. His blood pressure may be within our present accepted limits, he will show no murmurs on auscultation, or a soft "functional" systolic murmur, his urine will be negative, but an X-ray may show definite hypertrophy, or aortic dilatation, and an electrocardiogram may show a flattened or inverted T wave. He is being accepted daily for $100,000 and up, and proves a very costly risk.

In Dr. Fisher's paper on jumbo risks, 122 deaths out of 363, or 33%, were due to cardio-vascular disease. This is to be contrasted with 22% of cardio-vascular disease in the combined experience of 52 American companies for 1929. In Dr. Fisher's table suicide accounted for 21 deaths out of 363, or 6%, to be contrasted with 1½% in the combined experience. So that even in Dr. Fisher's carefully selected group of jumbo risks there would appear to be marked adverse selection in the case of suicide and cardio-vascular disease.

I append six headings to which I believe we should give more serious attention if we are to correct the present unfavorable experience in large cases from cardio-vascular disease. They might be incorporated in a special supplementary blank for cases of $25,000 or more, or they may well be stressed in educational communications to examiners.

DIAGNOSTIC SUGGESTIONS: CARDIO-VASCULAR DISEASE

(Larger policies and over age 45)

1. PERSONAL HISTORY.
   a. Have you or have you ever had shortness of breath, dizziness, pain, or a feeling of discomfort or oppression in heart or chest? Describe in detail:
   b. Does walking up hill, up stairs, or in the cold produce any of the above symptoms?
2. INSPECTION REPORT.
   Business worries, domestic difficulties, evidence of nervous strain, irritability, financial losses, speculation, the burden of excessive business or professional responsibilities.
3. EXAMINERS.
   The use of competent honest physicians whose selection is independent of agency pressure or choice by applicant.
4. OF SPECIAL IMPORTANCE IN EXAMINATION.
   a. Blood pressures—over 140 mm. Hg. systolic, or over 94 mm. Hg. diastolic.
   b. Past history or M.I.B. of hypertension, cardiac murmurs or irregularities.
   c. Pulse rate under 60 or over 80.
   d. Extra systoles or any cardiac irregularity.
   e. Soft systolic murmur at apex usually diagnosed "functional."
5. ADDITIONAL PHYSICAL EXAMINATION.
   a. X-ray of heart and aorta, especially for evidence of hypertrophy or dilatation.
   b. Electrocardiogram study, particularly noting any abnormality of T wave in leads 1 and 2, and delayed A. V. conduction time.
6. FUNCTIONAL TESTS.
   Cardio-respiratory, vital capacity, exercise.

DR. BRATHWAITE—In order that a more or less academic discussion of a paper thoughtfully presented to this Association may not be a routine commendation of it, attention is appropriately

directed to the painstaking accumulation of data that Dr. McCord has been instrumental in obtaining.

I refer to the Life Conservation Studies of the Heart Council of Greater Cincinnati, of which Dr. Muhlberg, the President of the Association, is also President.

In the interesting paper of Dr. McCord on "The Heart Problem of the Worker", the reader almost inadvertently questions in his own mind the relevancy from the standpoint of life insurance selection, of the meticulous details contained in the data on which these observations were evidently based.

The Heart Council of Greater Cincinnati has gone to enormous pains in obtaining the information set out in their life Conservation Studies, such as Physical impairments (1) among office workers and (2) among skilled mechanics.

One cannot fail to be impressed in that portion of these studies which pertains to cardio-vascular diseases, with the high per cent. of cardio-vascular lesions of greater or less importance; obviously much higher than is obtained in life insurance examinations.

Apparently the incidence of cardio-vascular disorders thus compared is greater among office workers than we would have supposed, or the method of examination more drastic. The obvious conclusion is that the latter is the case and that more intensive examination has been conducted than would be customary in life insurance, or, if I may say so, useful.

Further, one must exclude the element of possible self selection in that those who volunteered for these examinations might have been those who for one reason or another thought they might profit by it, inasmuch as they might have been of the opinion that some impairment existed. This might account for the apparent undue incidence of the cardio-vascular impairment beyond that which we would have expected.

The object of the Heart Council is expressed in the caption "Life Conservation" whereas in insurance the object is not primarily with the aim of conserving life but for the purpose of sorting applicants by examination into groups according to the mortality expected in each.

In our studies of mortality we must be careful not to be led into a wrong interpretation of the material data.

We must keep in mind that, in an investigation of the mortality in groups of impaired lives, we aim to determine the amount of extra premium necessary to cover the excess deaths expected among the future entrants into the same group. Death claims in the study of a given group become essential features of the study only when we subordinate the *causes* of death in the interpretation of the mortality within that group.

We may not take into consideration *only* those deaths obviously related to the impairment being studied because,

I. Differences of opinion would arise as to what causes should be considered as relative. For example, if in the study of mortality in overweights we include only those deaths occurring from apoplexy, nephritis and diabetes, or the like, we arrive at conclusions which may not sufficiently take into consideration that certain pre-existing impairments tend to diminish the probability of death from certain causes; thus we may over-estimate the significance of deaths from those causes while underestimating the significance of the fact that overweights are relatively safe from death by tuberculosis. And so it may be that savings arising from impairments such as overweight in cases with previous tuberculosis may be offset by excess deaths from apoplexy, diabetes and nephritis, and vice versa.

II. The limits within which a mortality ratio as found in an insurance investigation may be considered as significant are usually indicated by placing after the ratio its probable error. This equals approximately $\frac{2}{3}\sqrt{\frac{Actual\ Deaths}{Expected\ Deaths}}$ and it defines the limits within which it is an even chance that the true mortality ratio, of which the one observed is merely a random sample, actually lies. (140% ± 10% indicates that the true ratio is probably somewhere between 130% and 150%.)

Where the actual deaths are greater than the expected, as is usual in a study of impaired lives, the probable error tends to increase as the number of deaths becomes small. It follows, therefore, that if only deaths from certain causes are considered, the possibilities of wide variations in the ratios are greatly increased. Granting for the sake of argument, agreement on the causes of death to be considered relative to a certain impairment, and assuming that we should like to find the mortality ratio throughout the general population resulting from this impairment, we are confronted with the fact that we may observe only a relatively insignificant portion of the population which happens to be insured in a certain company.

These figures may show for a given impairment, say, one hundred deaths in a group where only fifty were expected, that is, a ratio of 200% but it could not be expected that another company investigating the same type of risk would show exactly the same ratio.

If the material selected by the various companies is homogeneous we can expect from mathematical considerations that about one-half the number of companies so investigating will show ratios between 187% and 213%, and the other half, ratios outside these numbers. In other words, our investigation would not show that the given impairment produces a 200% mortality but that there is an even chance that it produces a mortality between 187% and 213%.

Homogeneous impairment groups large enough to reveal as many as 100 deaths are rare even with the largest companies and yet if we analyze this group we shall be fortunate if we find as many as ten deaths due to a single cause. Therefore, it is evident that with what for an insurance company is a large volume of data, only very uncertain results can be secured as to relative mortality according to cause of death. In the clinical field the possibility of error would probably be even greater.

III. As a mortality table by causes of death as well as by age and duration would be required in order to properly estimate the expected deaths from each cause under consideration, and as such a table is not available, this fact is an additional reason, in the study of a special group of impaired lives, for including all deaths from whatever cause in the whole group.

Therefore, it may be said that limiting the study of deaths to those directly or indirectly attributable to the impairment (in a given group) would be laborious in practice and unreliable, as well as difficult of interpretation from the life insurance standpoint.

Hence it is that in statistics meticulously compiled such as is the case in this very interesting paper of Dr. McCord's we must be careful in interpreting the results from the life insurance standpoint, especially as no mortality element enters into the study except by inference.

It must also be borne in mind that we have not, as life insurance organizations, access to the very expert talent evidenced by the observers in the studies presented by Dr. McCord. We must make best use of the material which we have. The lesson that we have to learn in the interesting paper under discussion, especially in large risks and at the older ages, it seems to me, is that modern diagnostic methods including the use of the fluoroscope, electrocardiogram, oscillometer and x-ray should be more frequently required, as it may well be that cardio-vascular impairments are more frequent than, by the ordinary routine examination, we have been led to expect. And, on the other hand, we can by these more intensive examinations assure ourselves of the comparative inconsequence of conditions hitherto considered more grave, such as the more or less harmless arrhythmias and cardiac murmurs.

As relating to the Heart Problem so comprehensively recorded in Dr. McCord's paper, and though not specifically confined to any occupation, we have prepared a few lantern slides illustrative of conditions occurring in actual life insurance practice and observed

in the Diagnostic Laboratory of the Equitable recently. They are representative of conditions which, under a more rigid form of examination by the use of precise implements, would not have been so plainly demonstrated otherwise, if at all. These slides have been prepared by Dr. Ungerleider who will indicate the essential points at the time I read a short synopsis of the salient features.

SLIDES #1 AND #2 (*See illustrations*)

This is an electrocardiogram made in May, 1930, as a preliminary inquiry for additional insurance involving a quarter of a million dollars. A policy had been issued at standard rates in October, 1928. Four months after issuance in 1928 a disability claim was presented for coronary thrombosis, from which he apparently made a complete recovery.

Physical examination for additional insurance showed no adverse conditions except a personal history of three attacks of rheumatism and occasional pharyngitis.

This electrocardiogram shows a normal rhythm with an inversion of the T wave in the first lead and a notched Q wave in the second lead, with a large notched Q wave and a deep S wave in the third lead. The heart sounds were soft and distant and a systolic murmur at the left interspace was in evidence.

The diagnosis was coronary occlusion and the opinion was expressed in our Diagnostic Laboratory that the condition of myocardial infarction in 1928 resulted from an embolus detached from the mitral valve, probably as a result of acute articular rheumatism and tonsillitis.

It is safe to assume that had a cardio-vascular survey been made in 1928 in connection with the examination of this applicant, the findings would have altered the decision.

Fluoroscopy showed the desirability of a six foot plate of the heart.

SLIDE #3 (*See illustration*)

This is an electrocardiogram of an individual age 38 who has an intermittent pulse. No previous M. I. B.

His blood pressure was 112/66. The simultaneous polygram showed that the prematurity of the ventricular contraction was of no significance. This cardio-vascular survey enabled the Society to take a more favorable action on the risk than would ordinarily have been taken.

SLIDES #4 AND #5 (*See illustrations*)

This electrocardiogram was taken on an application for $50,000 of an athlete age 34. His previous medical history consisted of an attack of influenza in 1918 and antrum disease in 1924 which lasted three weeks, when his maxillary sinuses were drained.

Physical examination shows a very irregular heart action. On percussion his heart was much enlarged.

This cardiogram shows auricular fibrillation. The irregularities are quite obvious. The slide of the heart shadow shows extreme hypertrophy.

SLIDES #6 AND #7 (*See illustrations*)

This is an electrocardiogram and polygram of an applicant age 62 who applied for $50,000 with an optional additional $50,000.

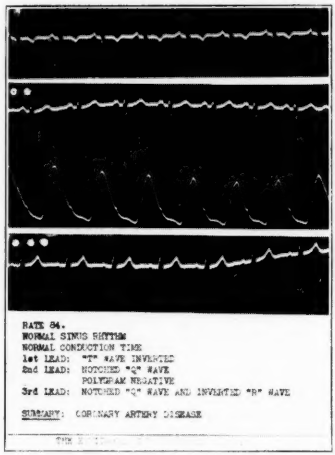
Physical examination showed an irregular pulse. We did a complete cardio-vascular survey including fluroscope, x-ray of heart, electrocardiogram and sugar tolerance test. Fluoroscopy and teleo-roentgenogram showed cardiac hypertrophy.

The electrocardiogram showed in the first lead right ventricular extrasystoles, inverted T waves; in the second lead, alternate extrasystoles; in the third lead, left ventricular preponderance.

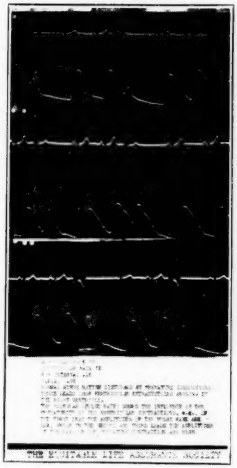
Polygram showed a pulsus alternans and the sugar tolerance series showed a blood sugar content of 132 mgs. fasting, 235 and 225 mgs. at one and two hours respectively after 75 grams of glucose, and 161 mgs. 2½ hours after the fasting determination.

SLIDES #8 AND #8A (*See illustrations*)

This electrocardiogram was taken on an individual age 45 who had a previous history of high blood pressure, 154/100. His blood pressure at the time of the examination was 162/120.


RATE 84.
NORMAL SINUS RHYTHM
NORMAL CONDUCTION TIME
1st LEAD: "T" WAVE INVERTED
2nd LEAD: NOTCHED "Q" WAVE
POLYPHASE NEGATIVE
3rd LEAD: NOTCHED "Q" WAVE AND INVERTED "R" WAVE
SUMMARY: CORONARY ARTERY DISEASE

SLIDE #1



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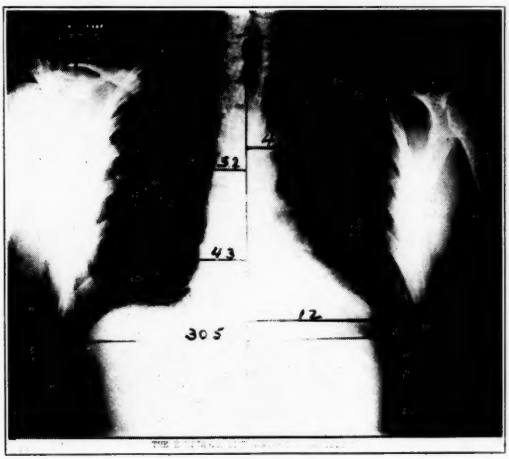
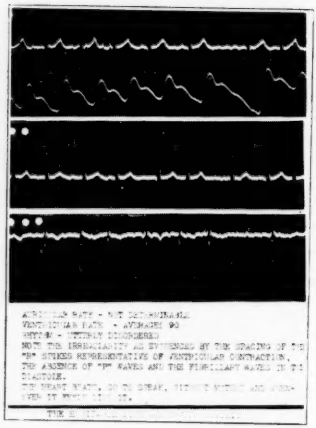
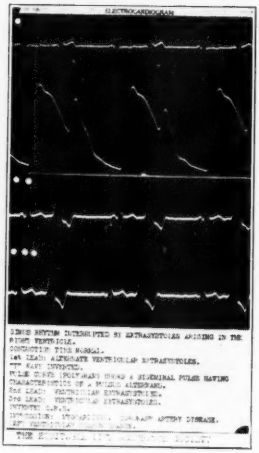


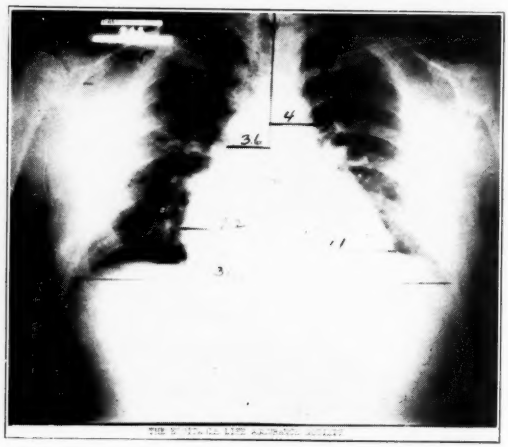
SLIDE #2



SLIDE #4



SLIDE #6



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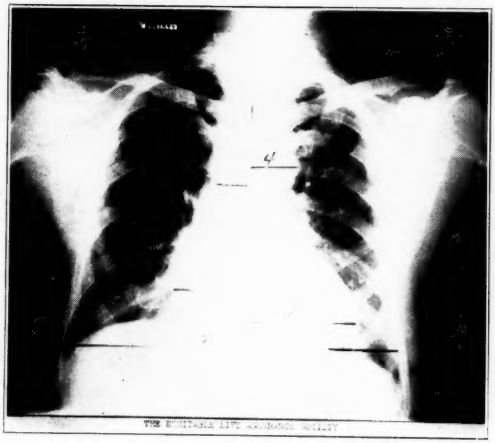
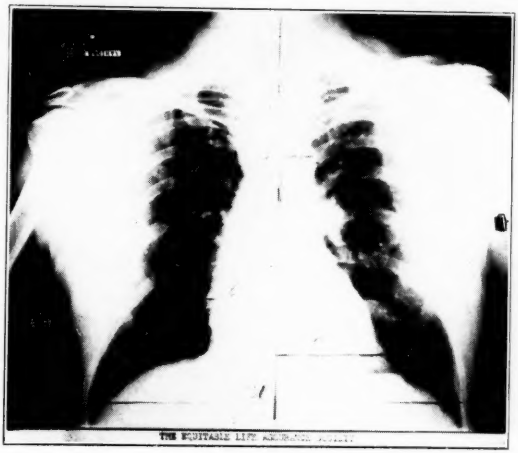
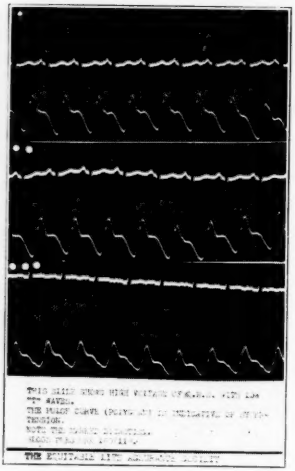


SLIDE #7



SLIDE #8A



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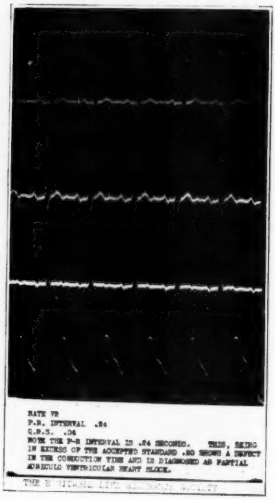
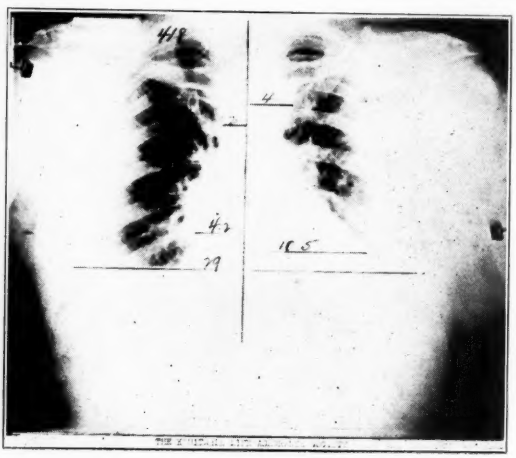
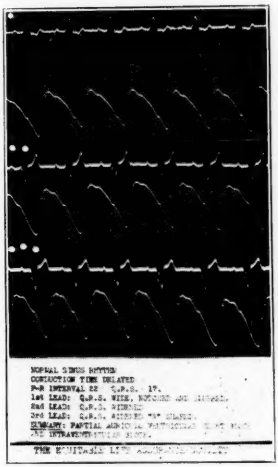

RATE 72
P-R. INTERVAL .24
Q.R.S. .04
HOWE THE P-R INTERVAL IS .24 SECONDS. THIS, BEING
IN EXCESS OF THE ACCEPTED STANDARD .20 SHOWS A DEFECT
IN THE CONDUCTION TIME AND IS DIAGNOSED AS PARTIAL
AURICULO VENTRICULAR HEART BLOCK.

SLIDE #9



SLIDE #9A



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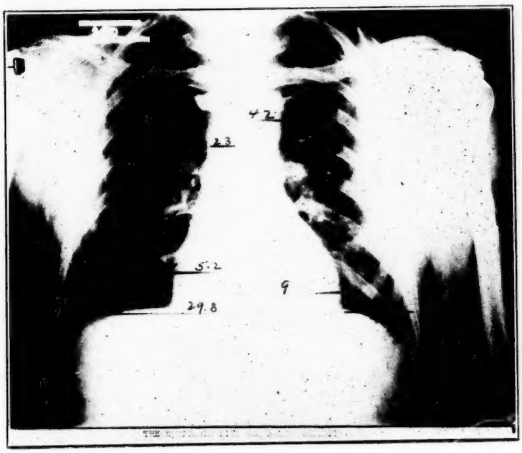

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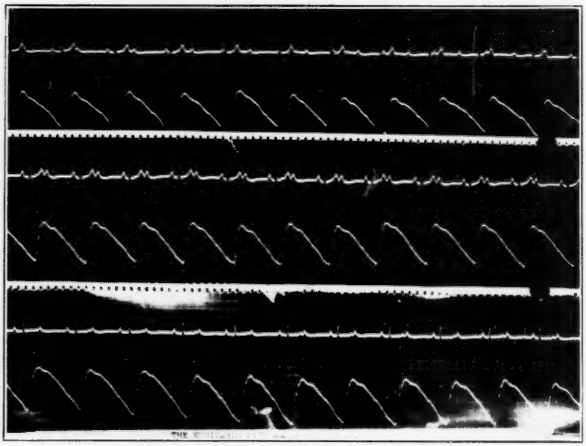
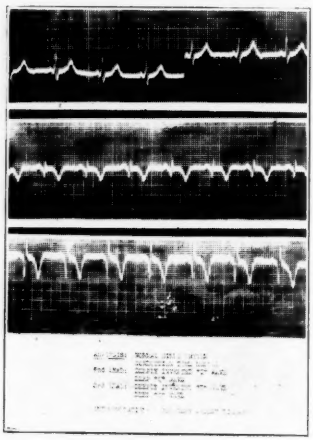
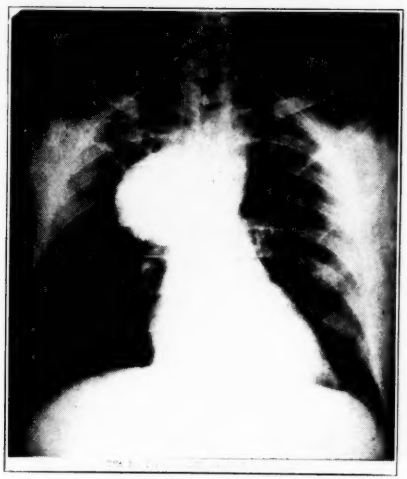


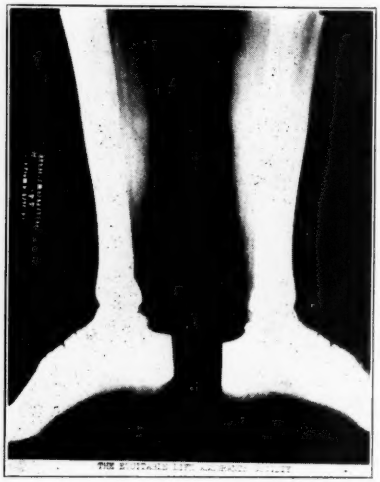
SLIDE #12 AND 13



SLIDE #14



SLIDE #15



SLIDE #16

On percussion his heart was entirely within normal limits. The second aortic sound was accentuated. There were no murmurs.

The electrocardiogram shows extreme heights of the Q.R.S. complex, with low T waves. The polygram shows extreme dicrotism which is frequently seen in hypertensive heart disease.

SLIDES #9 AND #9A (*See illustrations*)

This electrocardiogram is taken on an individual who desired his rating reduced. He had previously been rated for blood pressure and paralysis which occurred in both legs in 1915, lasting over a year before recovery.

His blood pressure in 1925 was 160/86. At the time of his examination his blood pressure was 130/84. The electrocardiogram shows an increase in the P-R interval, in this case .24 of a second, showing a partial auriculo-ventricular heart block.

SLIDES #10 AND #11 (*See illustrations*)

This is an applicant age 44 who had diphtheria in 1907, typhoid in 1892, appendectomy in 1926. He was examined at the Home Office and the examiners could not explain a so-called "heaving action" with a diffuse apex beat. He was referred for a cardiovascular survey. An electrocardiogram and a six foot plate were made.

The electrocardiogram shows a P-R interval .22 and a Q.R.S. interval of .17. In the first lead the P wave is low, broad and notched with a Q.R.S. wide, notched and slurred; in the second lead the Q.R.S. is widened and slurred and in the third lead the Q.R.S. is "W" shaped.

Teleo-roentgenogram showed mitral-type heart. The diagnosis was intraventricular block and the case was declined.

SLIDES #12 AND #13 (*See illustrations*)

This is an electrocardiogram and polygram of a male applicant 34 years of age who on examination was found to have a double murmur at the apex. There was no history of any infectious dis-

ease. He had no symptoms save a degree of bradycardia, pulse being 48 per minute.

The electrocardiogram shows an auricular rate of 96 and a ventricular rate of 48, there being complete auricular ventricular disassociation, the diagnosis being that of complete heart block.

In the second slide there is a polygram of a brachial pulse taken simultaneously. One can notice the influence of the ventricular contraction on the pulse which is regular.

SLIDE #14 (*See illustration*)

This is an electrocardiogram of a male applicant age 56, declined for $300,000 insurance, who gave a history a short time prior to examination, of an attack of indigestion and vomiting, necessitating his remaining at home a week thereafter.

This electrocardiogram was taken by his physician who submitted it as being normal. Our interpretation of the tracing was not in accord with that of his own physician.

We believe this slide is illustrative of coronary artery disease. There were elements of selection against the Society in this business.

SLIDE #15 (*See illustration*)

This is an x-ray of an applicant age 43 who applied for $300,000 and as much more as the Society cared to consider, whose physical examination yielded nothing of any moment but gave a history of pulmonary tuberculosis twenty years previously. He was slightly overweight and had had recently a pyelitis which had been cured; in the urine there was no pathology.

He described an x-ray which had been taken in 1928 and which showed a healed scar in the right apex. A clinical blood examination at our office showed no great departure from normal. The electrocardiogram was normal, rate 84, P-R interval .19, Q.R.S. .08 with normal mechanism.

By fluoroscopy a large shadow appeared in the right chest and this slide is a photograph of the x-ray which was made at

the same time which shows a large tumor in the right portion of the mediastinum, 10x15 cms. A diagnosis of mediastinal tumor was made and the risk was declined. There was some doubt in our office as to the nature of this tumor. Subsequently it came to our knowledge that it had been diagnosed as saccular aneurysm which had become completely clotted and there were many other features which subsequently came to our notice which were explanatory of this condition.

This case illustrates very conclusively the value of the study of large risks by the use of implements of precision; in this case x-ray.

SLIDE #16 (*See illustration*)

As a matter of routine in those applicants past 50 years, on whom we do a blood sugar determination at the Home Office, we have been taking x-rays of both extremities to determine whether or not there is any thickening of the vessels.

This slide illustrates a type of arterio sclerosis which we have met on several occasions and this, together with his blood sugar findings, was sufficient to decline the risk. The applicant in this case was 61 years of age.

This man had a previous history of glycosuria and casts. Our urinary examination showed no albumin present and a negative miscroscopic examination.

DR. HUSTON—Dr. McCord has given us a very interesting and practical paper. As underwriters we are interested in the subject as a cause of sickness as well as a cause of death. In reviewing the cause of death claims one cannot help but notice the increased number of deaths from cardio-vascular diseases, particularly at younger ages, but our experience has been that heart disease as a cause of death increases with age.

It is estimated that 2% of the general population have some type of heart impairment. According to Dr. James F. Rogers, "The findings in the draft as regards organic heart diseases gave an average of 30.74 per 1,000, with a wide range by States from

23.35 to 68.84. The rate for 'valvular diseases' in cities was 39.49 per 1,000 and in rural sections 28.82. In New York City the rate was about 48 per 1,000 . . . . . The average percentage of cases found in the examination of men in eight universities was 1.1 per cent., the highest number (Ohio State University) being 1.9 per cent." Approximately 4% of school children show some type of cardiac disease, and perhaps as many as 60% of these grow to maturity.

Boys who reach manhood with the knowledge that their hearts are impaired will naturally seek employment which is not of the laborious type. If this is true we would expect the incidence of heart disease in Dr. McCord's clerical group to be larger than reported.

There are two types of heart impairments. The valvular type appears more frequently in youth. It is usually due to some infection, and since rheumatic fever occurs most often in the young, we find a majority of the rheumatic heart cases in the young individuals. Of this group who live to manhood, a majority will die before age forty. The other type is the so-called degenerative type. It occurs more frequently later in life and the death rate is higher after age forty-five. I believe it is this group which is most affected by occupation.

In insurance examinations we find hypertension much more often in professional men, executives, brokers, men of large affairs and responsibilities. It is the type which we would naturally expect in dispatchers. Any man who is doing heavy mental work under a continuous nervous strain, is using up his heart reserve, and very soon will be found to have cardio-vascular disease. According to Dublin the death rate due to heart disease is higher among those working on the water. This is probably due to the fact that rheumatic fever is more prevalent on the Eastern Coast than in any other part of America.

It is not so much the type of occupation which causes heart disease as the manner in which a person reacts to responsibilities and to constant nervous pressure. Heredity, habits, environment and temperament are factors contributing to the incidence of heart

disease in any group. I believe all observers agree that rheumatism is hereditary in character. Hypertension is hereditary. O'Hara and Walker found 68% of over 500 cases who gave a history of high blood pressure in the family history. Glomset, of our own city, found in 100 cases that there was a distinct family history of high blood pressure. He took the blood pressures of 2,400 high school children and 39% of these with blood pressure higher than normal showed a high blood pressure in the family history. 10% of the children whose blood pressures were normal gave a family history of abnormally high blood pressure. It is reasonable to believe that a young man whose family history shows hypertension, when placed in a responsible position is more apt to develop a heart impairment than the one whose family history is negative in this regard.

Long mental concentration, rapid decisions, and long hours are distinct factors in raising the incidence of heart disease regardless of the type of work being done. A man working under these conditions, who is ambitious and does not take the very best care of his physical self, who worries and carries his work home, will probably sooner or later have some type of heart impairment. This has been referred to as "modern business pressure." There probably is not an investment broker in the country who has not shown a high blood pressure the last year.

Habits and environment play an important part in the cause of heart disease but temperament is perhaps a leading factor. You cannot work at high pressure all day, every day, lose your temper more or less frequently, be careless in diet, rest, and exercise, drink and smoke to excess, worry and take work home, without using excess energy and pulling down your heart reserve. Recently I was told by an executive of one of America's largest business organizations, who had been in his position about ten years, that his company had lost eight officers in that time and every one of them had died suddenly. It is not the job which causes the heart lesion, but how we react to the conditions necessary to do the work well.

Dr. MacKenzie—I will try to be three minutes. Gentlemen, I was intensely interested in reading Dr. McCord's paper, and after I got through reading it I felt that if I wanted to commit legitimate and respectable suicide, I would become a train dispatcher. The mortality is certainly terrific. The doctor says in one sentence here: "Some significance has been attached by cardiologists to the duration of breath holding time as an index of cardio-vascular abnormality." And then he says: "It has been stated that those persons unable to stop breathing for as much as 35 seconds should be examined with additional care for abnormality in this field. In one series of 1,000 examinees, it was noted that only 63 per cent. of the total group held their breath for 35 seconds, or longer, upon request; and that 50 per cent. of all persons rated as having cardio-vascular abnormality were in this group. The inference is that breath holding time with this standard does not afford helpful information as to cardio-vascular dysfunction."

We looked over our records obtained by the flarimeter. The flarimeter blow is somewhat different, gentlemen, than the pure breath holding test described as used by Dr. McCord. Taking the Tm (total length of blow), those that failed to reach 40 seconds among the standard risks were only 5.9%; among the rated, the failures were 13.7%; and among the rejected were 31.1%. The total for that group was 11.8%. When we tried a 50-second blow, in the standards there was a failure of 36 per cent.; in the rated, a failure of 43.9%; and in the rejected, a failure of 65.2%. The 50-second blow seems to be far too severe, and not sufficiently selective.

Now as regards the statement that "the inference is that breath holding time with this standard does not afford helpful information", I want to read a comment that was prepared by Dr. Wells, who is a mathematician. I am not.

Dr. McCord states that 63 per cent. of one series held their breath 35 seconds or longer, while one-half his cardio-vascular abnormals in this series also passed this borderline, and so he infers that the breath-holding test is of no help.

His own data show, however, that the chance of one of this series being a cardio-vascular abnormal is 70 per cent. greater when he fails, than when he passes the 35-second borderline. (The ratio $63/37 = 1.7$.) The fact that half his abnormals pass, shows merely that the 35 sec. borderline is lenient. A better borderline might improve the selection, but even this one discloses clearly the correlation of his "breath-holding time" with his "cardio-vascular abnormality".

Dr. McCord—I wish to thank the several persons who have discussed this paper. I am very grateful and am flattered that so much attention should have been paid to the work that we have done. I shall make no attempt to discuss all of the questions that have been raised here today nor in order, but I have picked out a number that have struck me as of particular significance.

The first was a reference to the breath-holding time. During the discussion that was going on, I took occasion to refer to the original report, the one based on the examination of 1,000 machine and hand tool operators, and will read our exact data from that section, the section referring to breath-holding time. We found 310 persons out of the 1,000 examined whom we accepted as having significant heart lesions. Forty-nine and seven-tenths per cent. of these cardiacs were able to hold their breath in excess of 35 seconds; 36.5 per cent. fell into the zone from 20 to 25 seconds; and only 13 per cent. in the zone lower than 20 seconds. I do not maintain that there is no relation between cardiac condition and breath-holding time, but I do feel that it may be desirable, highly desirable, that we step up the length of time from 35 seconds to either 45 or possibly 50. If we have taken 45 seconds as our standard, then most of our cardiacs would have fallen into the group of 45 or lower.

Just in passing, Dr. Cook spoke of paying attention to shortness of breath, dyspnoea. I would inject a word of caution there. We have found that many persons with cardiac neurosis exhib-

ited a definite dyspnoea which was definitely misleading. He indicated the necessity of checking up on heart rates. In our train dispatcher work, 85 and a fraction per cent. of our train dispatchers presented a heart rate in excess of 80.

I was very much impressed with the slides that were shown here and have made a note to refer to the left side hypertrophy that was true in every instance that I recall save one. Not every insurance company may do the high type of work with the electrocardiograph shown here, but nearly everyone has access to the x-ray which may reveal hypertrophy of the heart.

The high rate of heart disease in the office group referred to by someone is due largely to overweight, which in turn was due to their sendentary occupation. Many of them were 20 pounds or more over their best weight and they showed a very high incidence of cardio-vascular disease.

Dr. Huston referred to difference between rates in the country and in the city, and I would attach great significance to that. The urban resident, the worker in the city, is subjected to many more strains of the kind that have attracted our attention and we may expect a much higher heart rate from those causes in urban districts.

The next to the last speaker has indicated that in reality our office group incidence of cardio-vascular disease should be higher, and I would like to point out that in the manuscript we have left out a great many borderline conditions, extra systoles, sinus arrhythmias, trivial hypertrophy, minor arteriosclerosis and such things, although we believe that these conditions are significant and later on will pass over into a severer state. We did not feel justified in including such matters in our significant group.

I feel very strongly that if from papers that have been published in the past and papers that will follow, together with the work we have done, we may come to accept some relation between mental strain, anxiety states, hyperirritability and organic heart disease, we shall have some explanation for the very troublesome increases in heart disease that are now confronting us.

AFTERNOON SESSION

DR. MUHLBERG—We were all very much distressed last year when Dr. Rogers intimated that in the future we must expect a somewhat less active participation on his part in the proceedings of our Association. No program in the past has ever seemed quite complete without some contribution from Dr. Rogers, and I know I voice the sentiment of all members when I state that we hope he will continue, for many more years, to address the Association and enter into our discussions. This year, in order to test out his resolve, I asked him for a contribution and, much to my delight, he responded immediately in the old spirit and chose a subject that I know will be of the greatest interest to us —"The Past and the Future of Medical Selection"—Dr. Rogers.

DR. ROGERS—Mr. President and Gentlemen: I have so often spoken before this company of friends that I confess that I hesitated to speak again, but Dr. Muhlberg's invitation was so cordial that I decided, though reluctantly, to take down again my harp of a single string and to play upon it the tune you have so often heard before—Medical Selection.

My remarks this afternoon are bound to be largely reminiscent. In looking back over the records of the Association I was surprised to find that there is only one man now active in its affairs who antedates Tom Willard and Root and myself and that is our dear friend Fisher of the Northwestern. He came into the Association in 1890, forty years ago. Willard and Root and I came into it in 1893.

Now what was the condition of medical selection in those days? There was no such thing. Nobody knew anything about it. There were no facts of record upon which to base our predictions regarding the value of risks for insurance. The members of the Association discussed whether they should grant this kind of a risk a 20-year endowment or a 15-year endowment or what they would do with it. We did quite a good deal of work with death losses, analyzing them and endeavoring to draw from them information which should guide us in our selection. I am glad

to say that selection based upon such methods has long since gone into the discard where it belongs.

I am inclined to think that the first organized attempt to get our feet planted securely on solid ground was when this Association appointed Dr. Shepherd's Committee to determine heights and weights with relation to age. That was the first real contribution to the science of medical selection as we now know it. But even at that time there was an insistent demand for facts to guide us. Scientific medical selection was in the air. It was bound to come. The next step in the right direction was taken by the Actuarial Society in its Specialized Mortality Investigation. This work, when cautiously interpreted, proved to be of very great value. With its scientific medical selection became an established fact. We found ourselves for the first time on solid ground. A little later, on the recommendation of Dr. Dwight, our Association appointed a committee to study the mortalities to be expected in various groups of lives. In the very same year the Actuarial Society appointed a committee for the same purpose. It was very natural that these two committees should unite and pool their efforts. Thus came into being that splendid group of men, the Medico-Actuarial Committee, whose first report published in 1912, 13, 14 and 15, stands as a lasting monument to the two Societies. The later work of that Committee on Blood Pressure and on Occupational Mortalities places us under still further obligation and I have no doubt that in a few years they will add still more to that sense of obligation. Scientific medical selection may well rest upon the results of their labors.

There is one phase of the work of this Association which I may properly mention here. I refer to the pooling of the efforts of all of the companies for the protection of all. I doubt that you younger men know much about the origin of that work. When the present plan was first proposed the object that its sponsors had in view was simply to allay the friction that had arisen among the companies by reason of the operation of the old scheme of protection. There was no idea in the mind of anyone

at that time that it would ever amount to more than a means of keeping the peace in the insurance family. I remember very well when that change came up for discussion. Our friend, Willard, then rendered the Association very great service by his steadfast support of it. It was a battle of two days' duration and I am sure that the plan would have gone down to defeat if it had not been for him. He was young and full of vigor then.

As a matter of fact the plan has worked out very much better than the wildest dreams of those who originated it. It has become a very potent influence for good and its usefulness has steadily broadened with the passage of time. A very significant forward step was taken when the benefits of it were extended to all companies of standing in the country. The result has been to bring together into a united body Medical Directors of substantially all of the Life Companies. They have come together in friendly intercourse. They have come to know one another, to know one another's point of view. Moreover it is probably the greatest single point of contact or mode of contact among the companies. There is no doubt also that it will prove to be of very great service in the statistical field as well as in connection with disability benefits.

This problem of disability began to intrude itself upon our attention less than twenty years ago and has become steadily more difficult. We are now realizing more and more the need of cooperative effort among the companies to protect themselves in this matter. With such cooperative effort I am sure that this Association is in cordial sympathy.

I have been referring to those phases of medical selection which have to do with build, family history, occupation, personal history and the like. These are already quite well understood and within a few years, we may confidently believe, will be fully settled. Recently there has been developing among us an increasing interest in what I believe will prove to be the work of the future in this Association. I refer to various forms of efficiency tests. The question, as I see it, is how can we determine in any given clear-cut type of heart lesion, whether valvular or muscular, how

that heart will resist the strain of life: or with respect to the kidneys, how can we find means to test the kidney function so as to be able to say in any given case, kidneys of this sort will show about such a mortality: or in the case of glycosuria, will a given case showing some weakening of the carbohydrate metabolism degenerate rapidly or will it go on for many years. The splendid contributions of the New England Mutual and the Prudential with regard to heart tests and the fine work of the Metropolitan in urinalysis, all excite our admiration and approval. Papers like those of Dr. MacKenzie and Dr. Frost will, I hope, continue to be presented to the Association year after year. I have no doubt that in due season, through efforts like theirs, we shall arrive at answers to that phase of the problem of selection. I was very much impressed too with Dr. McCord's paper which showed, what has never been more clearly demonstrated, the effect of mental strain on the human organism. I think we do not need to go much further to explain the higher mortality rate from heart disease in our population.

Looking back through the recent history of our Association and bulking constantly larger is the fact that we are achieving so much of our results through cooperative effort and if I were able to shape the future activities of this Association, I should do so along cooperative lines. Any further work that is undertaken with regard to special aspects of our problem of medical selection should be undertaken only after deliberate consultation among the companies and carried out by groups of them working together. The life insurance business is too large, is too important and lies too close to the foundation of our social fabric, to warrant us to expect the best results in any other way than by working cooperatively.

I cannot sit down without saying a personal word. During the nearly forty years that I have been connected with this organization, I have had the pleasure of working in it with some of the finest men that I have ever known. I have never met finer men, more serious-minded men. They are men with whom it has given me the greatest pleasure to be associated.

DR. WILLARD—Mr. President and Gentlemen: When the President told me that I was to say something at the conclusion of the remarks of Dr. Rogers, he indulged in that official obscurity which is so characteristic of presidents. I didn't know what he wanted me to talk about and I asked him for a little bit of something to guide me, and let it go at, "Well, say something about Dr. Rogers." Now, he knows that I am a truthful man and he evidently thinks that this is a good chance for me to get back at Brother Oscar, who has all during these years abused me many times to your delight.

I might have labeled my few remarks, "The Memories of Thirty-seven Years, or What I Know About Dr. Rogers," and being a truthful man, I approach my task with glee. In 1893, as he has already told you, he, in company with some others, was inducted into this organization. He was a hustling youth. He had been a civil engineer—just why "civil" I don't know. He came in here and he wasn't awed by the old pundits that we had here; Lambert and Curtis were still here, Marsh of the Mutual Life was still here and his own chief was here at that time. He didn't seem to be scared by them at all. He commenced to hustle and, as a result of his political activities, he got himself elected Secretary, and, like most office holders, he held on to the job for a good, long time. What was he doing it for? He was doing it to get acquainted with all of the members, and he became a sort of father confessor to a very, very large number of them who would come and pour out their woes on his bosom, and like the fatherly individual he has since become, he then essayed the role of guide, philosopher and friend to the younger men, all of whom have remained his steadfast friends.

He was an inventor. He didn't tell you about that, but he did make a reference to it remotely and by indirection. He spoke of a harp with one string; he didn't tell you about the harp with a thousand strings. He invented a gadget with pins in it and columns running this way and that way and lines running this way and that way, all connected together by nice little pieces of twine —and that was the first mechanical attempt to solve some of the

medical selection problems by translating overweight into terms of increased mortality. And for a couple of years he used to appear around these meetings with that harp under his arm and everybody used to say, "Is Oscar going to tell us about that again?"

Well, he kept on with his inventions. He invented a sphygmomanometer. I heard some of the labor pains that were incident to that production, and I was rather familiar with some of the problems that he was seeking to solve and which he did solve. I think, however, it can be said that the contribution of that instrument, portable, small, easily used, probably did as much as anything to establish the idea of the talking of blood pressures by the medical profession generally and particularly by the life insurance companies.

There is another bit to his credit. (I am only telling the good things about him, because I am truthful.) He caught and tamed that wild hyperborean Hunter. You know Hunter is an actuary, and although we have made him an honorary member of our organization, to show you how Scotch he is, he went over to Edinburgh and got a degree of "Doctor" over there, so we can very properly, as many of us before that did mistakenly, call him "Dr." Hunter. Dr. Hunter was an actuary, and like all of those folks, he had little use for things that can't be put into a formula and can't be weighed in balances and said, "There ain't any such thing." Well, Oscar taught him that there was something in the medical idea of selection, and while he was teaching Hunter, Hunter was teaching him. He learned the actuarial lingo, and those two folks, by their mutual friction upon each other, became the polished partners in many and many an appearance before you. Their papers in collaboration are a part of the very wonderful history of this organization. It is true that some of the ribald members, a class to which I do not regard myself as belonging, used to refer to them as "the medico-actuarial song and dance team," but they have produced many valuable papers all of which have contributed to stabilizing and making more uniform the practice of all companies in the selection of risks.

Now these years full of accomplishment he modestly can't or won't talk about, but this organization is very, very dear to his heart. I think he was intensely earnest when he said that he never worked among more loving friends and companions than those of this organization, and so, when the word came to us from himself last year over in the Prudential office that he was about to retire, I am sure that you all received those words with dismay, as I did. It is true that his company, to taper off the cessation of his activities as Medical Director for this year, gave him a title, the unusual title of "Medical Advisor to the Executive," but even that rather nebulous job is going to terminate at the end of this year and after the first of January he will be divested of all his power and authority as Medical Director of the New York Life. After Oscar told us this, he very promptly disappeared. He didn't want to hear what some of the folks had to say on that subject. What they said was that it was unthinkable that he should not be with us and that we wanted him to understand that his dues would be remitted to him and he would be regarded as privileged to come to our meetings and discuss.

Now in view of these relations which we have held all these years, in view of the fact that his heart is bound up in this work, I am going to propose an unusual, if not irregular thing. I am going to ask the President to put this motion.

> Resolved, That Dr. Rogers be and he is hereby requested to retain his membership as Chairman of the M.I.B. Committee, as member of the Actuarial Committee, and to be prepared to do such other jobs as we shall prescribe for him.

I ask you to put that motion. (The President put the motion and it was carried unanimously and amid much enthusiasm.)

In bidding Dr. Rogers a modified good-bye I am sure I voice the feelings and sentiments of our entire membership in wishing for him, during the playtime that is now before him, all the enjoyment and happiness that is possible and that it may be shared in by that charming lady who had long been his partner and helper.

In the final analysis, it is the borderline case that engages most of the time and attention of the Medical Director, and whilst much has been written on this subject, so far as specific impairments are concerned, we have had very little information from authoritative sources that deals with the problem in its entirety.

No one is better qualified to discuss this subject than Mr. Hunter—his extended medico-actuarial experience, his clear and lucid style of expression and his splendid knowledge of medical insurance are again evident in his contribution on "Border-line Risks." Mr. Hunter.

BORDER-LINE RISKS

By Mr. Arthur Hunter, L.L.D.
Second Vice-President and Chief Actuary, N. Y. Life Ins. Co.

The purpose of this inquiry is to endeavor to determine the principal impairments which are included under the term "border-line risks", and to assist in laying a foundation for their more uniform treatment.

In discussions regarding medical selection the phrase "border-line risks" is frequently used but, so far as I am aware, no attempt has been made to define such risks except in general terms. Evidently they are risks to whom may be issued standard or sub-standard insurance, and, in companies which issue policies on standard lives only, to whom coverage may be granted or refused, depending upon the opinions of the medical staff, the actuaries and the underwriters. There can accordingly be no absolute definition of border-line risks as it would vary in the different companies. In view of the large amount of material now available on the mortality of different types of lives there is likely to be less difference of opinion with regard to border-line risks than formerly. If a sufficiently wide range be taken in one company the resulting group would likely include the most of those cases common to all companies except the few which issue policies on standard plans to persons with such impairments as heart murmurs, albuminuria, or glycosuria of moderate severity. I have accordingly obtained several groups from the records of the New York Life, the ratings being based on the numerical method. As will later be seen, the problem is not a simple one, involving an analysis of more groups than are apparent on the surface and the review of several thousand application papers for facts which are not usually recorded on mortality cards.

In considering the subject I have excluded questions arising with regard to either hazardous occupation or race. Cases which are border-line by reason of occupation alone can be readily ascertained by referring to the composite opinions of the Joint Committee on Mortality of our two societies, published in December, 1929, and to the rating books or occupation pamphlets of individual companies. Of the 430 classes in the booklet of the Joint Committee about one-third were rated from 20 to 35 points for occupation. With regard to race, enough has been written on the most important of these in this country,—Negroes, Japanese, Chinese, French-Canadians,—to enable companies to determine their treatment.

WHAT CONSTITUTES A BORDER-LINE RISK?

In companies which use the numerical method it is usually assumed that cases rated up to 115% are standard, that those rated 120% and 125% are border-line, and that those rated 130% and more are sub-standard. While the practice varies so that in one company cases rated 115% may be considered border-line there are other companies in which 130% may not be treated sub-standard. For the two principal groups in the present investigation I have selected persons rated 120% and 125% to whom policies were granted at standard rates, and those rated 125%, 130% and 135% to whom policies were issued with an extra premium or an advance in age. As will later be shown, the distribution of impairments varied substantially with different conditions.

If a company consider border-line risks as those rated 120% and 125%, the proportion of such risks to the total business on the basis of our experience would be about 6%, and if the classification were from 120% to 135%, inclusive, the proportion would be 11%. In an impairment, therefore, representing 5% of the total of border-line risks there would be one in one hundred and eighty cases with that impairment under the broader definition. The proportion to the total business of the company depends partly on whether

it does standard business alone or issues both standard and sub-standard policies, and also the limits within which the officials of the company consider that border-line risks lie.

In connection with the application of the numerical system it may be well to point out that border-line cases are not treated automatically but are carefully considered by medical directors and trained underwriters. It requires experience and intelligence to weigh the various factors in order to determine whether a case should be treated liberally or conservatively.

STANDARD CASES RATED 120% AND 125%

A search was made for 500 cases rated 120% and 125% on which standard policies were issued and under which there was no rating for occupation or habitat although there was a rating which ran from −15 for very favorable family history to +15 for unfavorable family history. Throughout this paper tuberculosis in the family history is excluded unless specified. The following shows the results:

Rating	No. of Cases	Percentage
120%	288	58%
125%	212	42%

Principal Impairments	Group (1)
Overweight alone	54.8%
Underweight alone	11.2
Tubercular family history, weight normal	4.4
Abnormal arterial tension	3.4
Overweight with other impairments	3.2
Albuminuria	2.8
Underweight with other impairments (principally tubercular family history)	1.8
Heart murmurs	1.8
History of tuberculosis (all kinds)	1.4
	84.8%

Neurasthenia was the only other impairment which constituted as much as 1% of the total. It may be mentioned that there was only one case out of the 500 under each of such impairments as glycosuria, renal colic, history of pleurisy and anemic appearance.

The foregoing table brings out clearly that the main problem in connection with border-line applicants treated as standard risks is build. It should be noted, however, that the practice of the Company in granting standard insurance to cases rated 30 or 35 points for overweight or underweight alone, when accompanied by the necessary credits, a practice which does not apply to other impairments, has tended to increase the percentage of the cases with either overweight or underweight. Except for those mentioned, there were very few double impairments involved, as they represented less than 5% of the total group.

As the cases were rated from —15 to +15 for family history, an inquiry seemed advisable to determine the effect of these debits and credits. There were too few cases among those with poor family histories to justify an analysis. Two groups were segregated, average (—5 to +5) and favorable (—10 and —15) the results of which were:

	Group (1) Family history	
	Favorable	Average
Overweight alone	68.5%	48.1%
Underweight alone	1.5	17.3
Overweight with other impairments	4.1	2.8
Underweight with other impairments	1.0	2.5
Tubercular family history, weight normal	1.0	6.0
Abnormal arterial tension	4.1	3.2
Albuminuria	2.5	3.2
Heart murmurs	1.5	2.1
History of tuberculosis (all kinds)	2.0	0.7
	86.2%	85.9%

The proportion of overweights in the group with favorable family histories is much greater than in that with average family records, while for underweights the reverse is the case. As will later be shown, the same condition appears in an analysis of the substandard cases. It would be incorrect to deduce that overweights have a more favorable family history than persons of slight build. It is probably due to the fact that about 50% of the Company's business is written on persons aged 30 and under, and in such cases,

where the family history of the applicant is not well defined, e.g., when both parents are alive but of middle age, the family history for overweights is considered leniently, but for underweights severely. As might have been expected, the group with average family history showed a much greater proportion of cases of tubercular family history than did the "favorable" group.

In order to determine what effect a small rating for occupation would have on the distribution by impairment, another investigation was made to obtain 200 cases granted standard insurance with ratings of 120% and 125%, including 10 points for occupation. These included both debits and credits for family history.

For comparison Group (1), 500 cases, is given with no rating for occupation, omitting impairments which did not account for more than 2% in the combined group.

	Group (2) Occ. Rating +10	Group (1) No rating for Occupation
Overweight alone	43.0%	54.8%
Underweight alone	22.5	11.2
Tubercular family history, weight normal	5.5	4.4
Underweight with other impairments	4.0	1.8
Albuminuria	3.0	2.8
Abnormal arterial tension	2.5	3.4
Overweight with other impairments	1.0	3.2
	81.5%	81.6%

In the group composed of cases rated +10 for occupation, the impairments of overweight and underweight alone constituted two-thirds of the total impairments which is the same as the group of cases where there was no rating for occupation, but the distribution was different. There was a smaller proportion of overweights and a larger proportion of underweights in the group rated +10 for occupation than in the other group, largely due to the high proportion of students in the group without rating for occupation. The proportion of overweights with other impairments was also significantly larger in the group which had no occupational rating.

SUB-STANDARD POLICIES

In the first group of sub-standard policies investigated (Group A), the cases taken were rated 125%, 130% and 135%, which included debits and credits for family history but none for occupation or habitat. These last were excluded as it was desired to determine the proportion of the various medical impairments. The number and percentage of cases at each rating are now given.

Rating	No. of Cases	Percentage
125%	155	21.0%
130	240	32.5
135	343	46.5
	738	100.0%

These percentages do not indicate the proportion which the cases bear to the total nor to the sub-standard business but merely their relationship within the group.

A synopsis of the principal medical impairments follows:

	Group (A)
Overweight alone	20.6%
Abnormal arterial tension	8.1
Abnormal arterial tension with other impairments	4.7
Heart murmurs or hypertrophy	4.3
Underweight with other impairments (principally tubercular family history)	3.9
Intermittent, irregular or rapid pulse	3.4
Alcoholic habits	3.3
History of tuberculosis (all kinds)	2.6
History of pleurisy	2.6
Albuminuria	2.6
Overweight with other impairments	2.4
History of syphilis	2.0
History of rheumatism	1.8
Underweight alone	1.5
Gall stones, gall bladder infection or renal colic	1.5
Paralysis	1.4
Dyspepsia	1.2
Otorrhoea	1.1
Infantile paralysis and marked deformity	1.1
Total	70.1%

No other impairment or combination of impairments had a ratio greater than 1%. The double impairments, neither

generally of enough significance to make the applicant sub-standard, covered about one-fourth of the total.

As was noted in the description of the standard group I, build is the most important problem in border-line cases, but this factor by itself accounts for 66% of the standard cases against 22% of those sub-standard. This difference can partly be explained by the Company's practice of granting standard policies to applicants of abnormal build when the family history is good.

In order to determine whether the credits or debits for family history had any influence on the distribution by impairment, we have divided the group into three sub-groups of family history—(1) Favorable, with ratings for family history —15 and —10, (2) Average, with ratings —5 to +5, and (3) poor. As there were few cases with a poor family history, the analysis has been confined to the other two groups.

SUB-STANDARD CASES RATED 125%, 130% AND 135%

	Group (A) Family history	
	Favorable	Average
Overweight alone	24.0%	14.1%
Abnormal arterial tension	9.1	6.3
Abnormal arterial tension with other impairments	5.2	3.9
Heart murmurs or hypertrophy	5.4	2.4
Underweight with other impairments (principally tubercular family history)	1.5	8.6
Intermittent, irregular or rapid pulse	3.1	3.9
Alcoholic habits	3.5	2.8
History of tuberculosis (all kinds)	2.5	2.8
History of pleurisy	2.3	3.1
Albuminuria	2.7	2.4
Overweight with other impairments	3.1	1.2
History of syphilis	1.5	3.1
History of rheumatism	1.5	2.4
Underweight alone	0.6	3.1
Gall stones, gall bladder infection or renal colic	1.9	0.8
Paralysis	1.5	1.2
Dyspepsia	1.7	0.4
Otorrhoea	0.6	2.0
Infantile paralysis and marked deformity	1.5	0.4
Total	73.2%	64.9%

Among the favorable family histories there is a larger proportion of overweights than among those with an average family record, while the reverse is true in the case of underweights. The same condition was noted among standard risks. This may be due to young overweight applicants whose family history is not well defined, being treated leniently for family history, whereas underweights of the same age would have their family histories rated more conservatively.

In order to determine whether there was any material effect on the distribution by impairments when a credit of 10 or 15 points was given for occupation, 100 additional sub-standard cases (Group B), principally farmers, teachers and lawyers, were analysed. On account of the credit for occupation there is a larger percentage of the principal impairments, other than abnormal arterial tension, than in Group A.

SUB-STANDARD CASES RATED 125%, 130% AND 135%

	Group B Rating for Occupation —10 or —15	Group A No Rating for Occupation
Overweight alone	17.0%	20.6%
Underweight with other impairments	13.0	3.9
Heart murmurs or hypertrophy	11.0	4.3
Alcoholic habits	10.0	3.3
Overweight with other impairments	8.0	2.4
Abnormal arterial tension alone or with other impairments	7.0	12.8
Gall stones, gall bladder infection or renal colic	6.0	1.5
History of tuberculosis (all kinds)	3.0	2.6
Intermittent, irregular or rapid pulse	2.0	3.4
Underweight alone	1.0	1.5
	78.0%	56.3%

It is evident from this and other exhibits that the proportion of the principal impairments does not depend upon the total ratings alone, but upon other conditions.

There is a marked difference in the proportion of underweights and of persons with unsatisfactory alcoholic habits between border-line risks without a credit or debit for occupation (Group A) and those with a credit for occupation

(Group B). It may be conjectured that there is an abnormal proportion of underweights and drinkers in the occupations in which the credits are allowed, that more complete reports of the habits of those in favorable occupations are obtainable, or that the lower average age in (A) than in (B) affected the results.

Another group (C) of 100 cases has been segregated where the ratings were 115% to 120% but were treated as sub-standard. There was no rating for either occupation or habitat. There were credits, however, for family history and build which reduced the ratings below 125%, but the impairment itself was of sufficient moment to constitute the applicant a sub-standard risk in the minds of those charged with the selection. The important impairments were:

SUB-STANDARD CASES RATED 115% AND 120% WITH NO RATING FOR OCCUPATION OR HABITAT

	Group C
Abnormal arterial tension, alone or with other impairments	28%
Heart murmurs	11
History of rheumatism	5
History of pleurisy	4
Renal colic	4
Alcoholic habits	4
Overweight alone	3
Intermittent, irregular or rapid pulse	3
Albuminuria	3
	65%

Such a low percentage of overweight cases was not found in any other group. The foregoing synopsis indicates clearly the operation of the rule that credits must not offset debits for material impairments to such an extent as to give standard insurance to applicants, except in the case of ratings for build alone.

SUMMARY

A summary of Groups 1 and A may be of assistance before proceeding to the next part of this paper.

Standard

1. The impairment of overweight or underweight covers two-thirds of the border-line cases to whom standard policies

were issued. Overweight or underweight with other impairments accounted for 5%.

2. A tubercular family history, with applicant normal or sub-normal in weight, is next in importance, accounting for about 6%.

3. The impairment of abnormal arterial tension (3%) is next on the list, followed by intermittent albumin on examination or a history of albumin (3%), and heart murmurs (2%).

Sub-standard

1. The impairments among borler-line risks which are treated as sub-standard are principally overweight, abnormal arterial tension, heart murmurs, underweight principally with a family history of tuberculosis, abnormal pulse and alcoholic habits.

2. The less frequently noted impairments in their order may be listed as a history of tuberculosis or pleurisy, and albuminuria present on examination in small amounts, or intermittently. Syphilis, which covers 2% of the cases, is always treated as sub-standard by our Company.

The proportion which the various medical impairments bear to the total impairments in the group depends on such factors as occupation, habitat and family history.

Where insurance on sub-standard plans is issued with ratings of 115% to 120%, there is a larger proportion of impairments of the circulatory system and of a history of rheumatism, than among those with ratings of 125%, 130% and 135%.

MORTALITY AMONG BORDER-LINE CASES

Several years ago we made an investigation into the mortality on border-line risks issued during a period of three years, with an average exposure of six years. Two groups were selected: (1) those rated 120% and 125%; (2) those rated 130% and 135%. No differentiation was made between

the policies issued on a standard or a sub-standard basis. The expected deaths were calculated on the A. M. Select Table, but have been adjusted so as to be approximately on the basis of the Company's experience on standard risks over the period under investigation. The relative mortality was 122% approximately in the group of risks rated 120 and 125, and 130% approximately in the group of those rated 130 and 135. There were 1,088 deaths in the former and 512 in the latter—a sufficient number upon which to base the conclusion that the experience was reasonably close to the ratings.

COMMENTS ON BORDER-LINE RISKS

I hesitate to suggest the means of treating border-line risks as that term may be differently interpreted by different companies and as one's viewpoint must be affected by the practice of the company with which one is connected. A paper of this nature, however, would not be complete unless suggestions were made which would bring up the subject for discussion so that the point of view of a number of experts might be obtained. I have accordingly ventured to make certain comments or suggestions on the principal impairments which appear in our analysis of border-line risks.

The present analysis confirms the impression of medical directors, actuaries and underwriters that the principal cause of friction between the companies and their agents and, in fact, between different companies, is the treatment of build, chiefly overweight. In the case of standard risks the experience of the New York Life shows that in two-thirds of the cases the question of either overweight or underweight was involved, while in the case of sub-standard policies it was one-quarter.

Many companies base their treatment of overweight on the report of the Joint Committee of the Actuarial Society and the Medical Directors' Association (1920), while some companies modify these composite opinions to conform with

their own experience, or, frankly, to meet competition. If a company does not issue policies on sub-standard plans there is pressure to issue standard insurance on these border-line and somewhat sub-standard risks among overweights, which creates friction with the agents of other companies to whose applicants are issued policies with a small advance in age or extra premium. Naturally the agents of the latter companies then bring pressure to bear on their own companies to reissue the policies at the regular rate of premium. This situation cannot be remedied at present. All we can hope for is that the companies, whether granting standard policies alone or standard and sub-standard insurance, will treat each case strictly on its merits. When the new statistics of the effect of overweight on mortality are published by the Joint Committee on Mortality, the differences between the treatment by the various companies may be diminished.

The next in order of importance is abnormal arterial tension, which by itself or in combination with other impairments covers 4% of the standard and 13% of the sub-standard business. The same type of difficulty confronts the companies as with overweights. There should, however, not be so much difference of opinion with regard to abnormal arterial tension as in the case of overweights, since the report of the Joint Committee on Mortality relating to high blood pressure is reasonably convincing. There still remain the interpretations of the results of that study and the modifications which may be made according to the experience of individual companies. The main difference in practice is probably due to the method of treating cases in which two or more observations have been taken with varying results. When the first reading is higher than normal, whether systolic or diastolic, one or more additional observations are made. Should the highest, the average or an intermediate figure be taken? If the application is for a large amount of insurance, has the applicant, after the first test, put himself under the care of a physician with a view

to reducing the blood pressure? Has the applicant a record of high tension in the past, and if so, how long ago? With regard to a record of high blood pressure followed by normal readings, a review of several hundred death losses under policies for large amounts issued on standard plans and more moderate amounts on sub-standard plans showed that the Company had been too lenient with such a history and had, in fact, in a number of instances been deceived by deliberate "grooming" of the risk.

When heart defects are considered, great difficulty is experienced in arriving at a uniform treatment as the findings may vary in the different examinations. All of those now under consideration would probably come under the old categories of functional or innocent murmurs. Using the classifications adopted with the medical code in 1925, standard policies are generally issued nowadays in the best type of cases where there is an inconstant systolic apex murmur. Where such a murmur is constant, is not transmitted to the left, and where there is neither hypertrophy nor a history of rheumatism or of tonsilar infection, standard policies are generally issued up to age 35 or 40, and on a slightly sub-standard basis above these ages. A similar treatment is accorded to basic heart murmurs in the aortic area, and to systolic basic murmurs in the pulmonic area, when not transmitted. Where there is doubt of the nature of the murmur or of the efficiency of the heart muscle in applications for large amounts, an examination is frequently made by a medical referee specially trained in this work, or by a leading specialist on heart diseases.

Various means are in use to eliminate the applicants where the heart muscle does not seem to stand up to its work under strain. Two of the most interesting tests are now being conducted by the New England Mutual and the Prudential. The former is using the cardio-respiratory test, under which the strain is tested by a spirometer (blowing test machine), the results being recorded by the changes in the systolic

blood pressure. The latter, which is known as the flarimeter test, is also made with a spirometer. It is based on the idea that the vital capacity, as indicated by the spirometer, and the ability to hold the breath give an index of the efficiency of the circulation. A standardized exercise test is also used so that by this combination of the so-called vital capacity, breath holding and exercise, it is hoped by the originators to obtain a more accurate estimation of myocardial inefficiency and pulmonary impairments. (See Transactions, Medical Directors' Association, Volume XVI, pages 36-38.) Some companies have already installed or are installing the electrocardiograph machine at their home offices with trained men in charge, and expect to extend it to other cities where they have salaried medical examiners, the interpretation of the results being made at headquarters. These procedures should reduce the number of doubtful cases so that they come more clearly in the standard or sub-standard group. In the meantime we must wait to determine the mortality until sufficient material has been accumulated under these new methods of examination and selection.

In connection with heart murmurs we might consider rapid, irregular or intermittent pulse, which accounts for about 3% of the cases in the sub-standard, and less than 1% in the standard class. The number of beats the pulse skips per minute, the degree of the irregularity and the rapidity must all be taken into account. Where such cases are taken on standard plans it means that the impairment is of a slight degree. Little need be said on this score, as enough experience has already been published to enable us to deal justly with this type of impairment. Furthermore, our contact with the practice of other companies does not indicate that there is any marked difference of opinion on the subject.

In the case of albuminuria, which for standard risks would cover principally intermittent, or, if constant, found in small amounts, we find that it accounts for from 2% to 3%. The

difficulty in dealing with this impairment is that there is such a wide difference in the cases. The degree of the intermittency, the extent of the albumin, and the history in the past are all matters of importance. With so many factors to consider, it is no wonder that the companies differ in their treatment of such risks, and even that individual companies are not always consistent. This applies to certain other impairments, one of which has been mentioned—abnormal pulse—and also to an old history of tuberculosis.

Among the cases which were accepted on the standard plan, there was none under which alcoholic habits were a vital factor, whereas among the sub-standard they ranged from 3% in Group A to 10% in Group B. This indicates that the Company did not accept on standard plans persons whose habits were questioned unless all doubts were cleared up.

So far as concerns double impairments, the principal of which is probably a family history of tuberculosis with light weight, there are too many types to present any extended comments thereon. Apart from the one just mentioned, under which there is a fair uniformity of treatment, they consist of two impairments, neither of which in itself would render the applicant a sub-standard risk. Taken together they present a picture which indicates a weakness, a possible lack of resistance to certain diseases, or a tendency towards a more serious condition. Statistics would be of little value as the interplay or correlation between the two impairments would usually be more important than the margin between standard and sub-standard; furthermore, it depends on the judgment of the individual.

CONCLUSION

It is quite evident that the subject of border-line risks is not a simple one and that their classification by impairment depends upon a number of factors, such as family history, occupation and habitat. The Company's practice with regard

to allowing credits against debits for certain impairments so as to bring the total ratings within the limits for standard risks also has a distinct bearing on such distribution. The distribution by impairments is apparently also influenced by the form of insurance issued, standard or sub-standard.

In dealing with border-line risks I am conscious that their distribution by impairments may vary not only in different companies, but also in the same company over a period of years. By careful selection of risks, cases with a specified impairment may be transferred from the sub-standard to the border-line category. On the other hand, a good experience on another group of border-line cases brings a lenient selection, resulting in a mortality which calls for a distinctly sub-standard rating. This brings me to mention a point of view which has resulted from studying many classes over a number of years,—namely, that there is a psychological influence on medical directors, actuaries and underwriters, from studying markedly favorable or unfavorable results. Let us take a class which will make my point of view clearer without stating the impairment in mind. In the M. A. M. I. the mortality under a certain impairment was unfavorable among the underweights and favorable among the overweights. This was in accordance with preconceived ideas. As the result, many companies began to be more severe in their treatment of the underweights, practically ignoring the impairment among overweights. Due probably in large measure to this attitude, the mortality in recent years has been generally favorable among the underweights and unfavorable among the overweights.

In the foregoing analysis I hope a beginning has been made in determining what border-line risks are, which will focus attention on how they should be treated. The experience of one company cannot be conclusive but merely indicative until material is obtained from other companies. It is to be sincerely hoped that other companies will analyse

their material, not only those which use the numerical method of rating risks, but those with other systems of selection. By obtaining more data and by applying the store of knowledge of medical directors and actuaries to these different problems, advances will undoubtedly be made to the great advantage of all insurance companies.

DR. PATTON—Border-line risks are well defined by Mr. Hunter who is so well and favorably known to us all. We have received much valuable information and instruction from him in the past. He here gives us additional reasons to congratulate our Dr. O. H. Rogers on the opportunities he has had to work with Mr. Hunter and to thank Dr. Rogers for bringing the other half of the due into our councils.

Additional to defining border-line risks as those who might be issued standard or sub-standard insurance, I would add that in our office where we group risks and do not use the numerical rating system we have such cases at the dividing lines between these groups.

Our standard approvals usually include those where we do not anticipate more than 120% M/A mortality. Thus we consider those we feel might give an M/A rate from 120 to 130% would constitute the border-line risks between our Standard and Special A ratings. This group should include most if not all the border-line risks of those companies who do no sub-standard business.

This unfortunately does not seem to be the case, for all home offices that handle sub-standard business are continually faced with the information that certain standard companies well known for their conservatism have granted standard insurance. The interested agent then requests or demands reconsideration on account of the other company's action so that he may meet this competition on even terms.

I have not reviewed our action and results with our groups, as that would necessitate a study of all our standard and sub-standard business to see what had been our experience with

what we would consider were the better or poorer 10% of the group per our reasons for placing them in the group.

Undoubtedly a study of any company's files would show practically the same reasons for border-line classification as those found by Mr. Hunter. Build furnishes us with the largest portion of such cases in our office and overweight more than underweight when build alone is considered.

We have followed quite closely the M/A results for build and are certainly very much in hopes that the present study will show a more definite line for us all to follow. A preliminary study of our weight cases has not shown good reasons for any particular change.

Our varying from the M/A figures has been in a few cases where we felt the personal and family histories were most favorable and not then unless the weight distribution was such as to indicate the case might be exceptionally favorable.

We have always considered occupation as one of the factors involved in any group of cases that might require a rating or might be accepted at standard.

Our experience with blood pressure findings and records has caused us to tighten rather than to lighten on those cases with border-line findings. There are so many cases that can have their blood pressure improved by a number of different methods, and the knowledge of this has become so well known to applicants and agents that it behooves any office to consider such cases with extreme care. Better let the other company have such an occasional case than to lower your own well developed and well considered lines of selection just because you are importuned by the interested agency.

Heart cases have been giving most of us more favorable results because we have crystallized our methods of examination and been able to classify our cases. Still we have to walk carefully and have much to do before we can safely change our border-lines in selection of heart cases. We are working with the Flarimeter in our office and have increasing faith that it will prove of much value in insurance and clinical medicine.

There are certain debits that no case can present enough credits to offset them and no debit can be disregarded with the same equanimity as a credit.

Albuminuria has been so thoroughly studied in our laboratories and in our insurance experience that we can feel quite reasonably safe in our selection of these cases. We should not be satisfied with a single urinalysis or a field examination where there are present findings or previous records. Though the amount found may be occasionally misleading, yet if local bladder or urethral contamination can be ruled out, our experience has shown a definite increase in mortality with an increase in the percentage of albumin found.

We can all agree with the summary Mr. Hunter has given us for selection of the border-line risks in standard and substandard groups. Our experience with our Special A, B, C and D groups as a whole has been favorable but there are some high and low spots in the various impairments as we have selected them. We are just revising our instructions to the Home Office approvers (medical and lay) and expect to make some further modifications when we receive the results of the present joint study that is under way.

The presence of two or more impairments, none of which is grave enough to cause a rating, should never be disregarded and all such cases call for very careful thorough consideration before a decision is reached.

Dr. Knight—In this admirable paper Mr. Hunter presents sound and important addition to the published reports of the New York Life Insurance Company upon the results of the accurate, scientific measurements of the insurance value of applicants that it is developing and has been carrying on since 1892. Some of us recall that he and Doctor Rogers then began their first systematic study of all that had been insured in the Company during the twenty years prior to 1890 and also of some 25,000 rejected lives. They finished their final analyses in the latter part of 1903 and upon the results of them "laid

down standards to be used in the routine selection of all risks whether standard or sub-standard." In 1907 Doctor Rogers told us in his paper that that system of medical selections had been applied to the current business of the Company since January, 1904, and that "since then the Medical Department has had nothing to do with plans of insurance, nor has it had to decide whether any given risk shall be placed in the standard class or excluded from it. The Medical Department places a definite valuation upon each risk. It estimates the probable mortality befitting the case and leaves to the Actuary to decide what plan of insurance is best adapted to provide for that mortality."

In that year and for several years prior thereto the ratio between the expected and the actual losses on the substandard lives insured in that Company remained steadily at 95% of that which they had anticipated. I give those figures here because some of us might otherwise be surprised that the present actual experiences of that Company with its border-line cases, standard and sub-standard, are permitted to go along at so near 100% of the expected, Mr. Hunter's figures from his last study being 122% with a mortality expectation from 120% to 125%; and 130% on those with an expectation of 130% and 135%. These figures are particularly impressive because so large a proportion of those border-line risks are overweights who are insured at the younger ages and whose mortalities are bound to increase as they get older. Thus they may find later on that these present treatments are too liberal though meanwhile they have shown wonderful ability in making the ratings to so approximate the mortalities. But here we must recall the same statement that Doctor Rogers made in his paper of 1908 of his notion of an ideal life company. He said: "My ideal company presupposes an ideal medical selection, in which the value of each risk which enters into the company's composition is accurately fixed in advance of its admission. Into such a company I would admit every risk whose mortality was equal to or better than that provided for in premiums charged, and I would refuse all risks in

which the mortality was clearly greater than that so provided for."

The splendid paper presented by Mr. Hunter and Doctor Rogers in 1916 upon border-line risks is also well worth re-reading at this time. Speaking then of the unfortunate differences of opinion regarding border-line risks in the various companies they said: "This situation of our affairs is unsatisfactory; it reflects upon our skill as experts in the selection of risks. We are not making full use of the tools that lie at our hands. We are still employing methods which should long since have been abandoned. If any of us accepts a risk which another has refused, the reason should be, not that we differ materially in our judgment of the value of the risk, but that, knowing full well its insurance value, the company that accepts it does so because it practices a more liberal selection; it draws the line which separates standard from sub-standard risks a little bit further towards the sub-standard end of the line.

"Does it not appear evident, then, that the task before us is to place ourselves in position to assign a definite value to each risk, a value measured by standards agreed upon among us, acceptable to us, and based upon the best information available at the time of their adoption? We have material enough at hand for the purpose; we have knowledge enough at our command to interpret it aright; why, then, should not the Actuarial Society and the Medical Directors' Association prepare standards, and place them at the disposal of all life companies that may wish to use them in the selection of their risks? . . . . . In thus referring to the standards in use in our own Company, we do not wish to be understood as appealing for their adoption by other companies. We are appealing for the adoption of standards, not for the adoption of our standards. . . . . The data at hand are abundant, and it should be possible from them to prepare and publish, so that all life companies that care to do so may use them, standards which shall serve to measure every risk so far as these factors (build and family history) are concerned."

Later on in that same paper the writers also speak of the paper read before the Actuarial Society in 1914 by Mr. Little, who published, as they say, "in detail the differences in mortality due to differences in height alone. The evidence is quite strong that the element of height makes a substantial difference at some ages and at some degrees of over and under weight, and that, in the preparation of standards, these differences should be taken into account."

They also said, what differs somewhat from what I have just quoted from Doctor Rogers' paper of 1907: "In doubtful and border-line cases, however, or where the amount of insurance involved is large, a comprehensive and exact valuation requires the cooperation of medical experts. Any group of lives, homogeneous in so far as the fundamental factors are concerned, includes individuals which are better risks than the average of the group, as well as those that are not so desirable as the average, due to favorable or unfavorable hereditary tendencies, to slight differences of occupation, of habits of life, and the like. Evidently an individual risk, measured purely mechanically, will be found of equal value with every other in the group. . . . . .The basic facts of the record are supplemented by testimony calculated to distort the picture in favor of the applicant for insurance, and it requires a nice discrimination to recognize those other features of the case that are not so favorable. Risks near the border-line have to be very carefully studied, and the value of definite standards lies in the circumstance that they express with great accuracy the mean or average value of the group, and furnish the selector with a basis upon which to make those fine distinctions necessary to be drawn in the accurate valuation of doubtful risks. Work of this sort falls within the province of the medical expert. When a risk is found by the use of established standards to be near the border-line, it then becomes the legitimate subject for the special consideration of the medical director. Indeed, it is among these border-line risks that the assistance of the medical expert is especially necessary." That is indeed a splendid emphasis on the

necessity of keeping our medical judgments in accord with truths and procedures that we have laid down after mature deliberations.

And now with these preliminary quotations I would say that Mr. Hunter in his discussion of border-line risks very properly emphasizes the difficulties that arise out of the variety of methods used by the various companies in handling such applicants. In the Metropolitan, where the numerical rating is employed with decidedly wider groupings than in the New York Life, we are quite content to evaluate the applicant as to whether he belongs in one or another class of risks. In other words, our problem is to determine whether in a particular case we shall recommend either super-standard or standard insurance or in other instances standard or sub-standard insurance, the latter being still further subdivided into what we call Intermediate, Special Class A, or Special Class B groups. These particular classes represent certain ranges of expected mortality values—up to 110%, up to 125%, 125% to 150%, 150% to 200%, 200% to 250%. But we do not attempt to qualify our rating of an applicant within as narrow limits as appears to be the case in the New York Life and in those Companies that employ a similar procedure. On the whole, we feel that our methods give us more leeway and that they are working out satisfactorily to the Actuaries and to the policyholders.

Our outstanding groups of border-line cases are the overweights and underweights, just as Mr. Hunter has found them in his Company. They amount to about two-thirds of all the border-line cases, and of these the overweights exceed the underweights in the proportion of 5 or 6 to 1, so that they are the predominating groups of overweights that call for particular attention. The general attitude in recent years has been to be fearful of them and I wonder if Mr. Hunter may not later on give us the actual experiences in his Company with that one group of overweights which constitutes so large a part of his border-line cases. Surely some of them are highly impaired risks and are not fit for standard insurance. On the other hand, our studies seem to indicate that there are some overweights who can be counted to give

reasonably good mortalities for reasons other than family histories. For example, in the studies of the Union Central experience made several years ago it was found that certain types of overweights had a mortality appreciably lower than the average, namely, those of short or medium height who had relatively short trunks, and those who were tall overweights with relatively long trunks. Moreover, it was found that overweights with large chest girth gave worse mortality. Some of those results were surprising and we believe that this is a line along which further research should be made. In the Metropolitan we have felt that in many instances where the exact weight by scales was not given there was a marked tendency on the part of the applicant to understate and on the part of the examiner to underestimate the correct weight. For this reason in the last few months this Company has purchased three hundred portable scales, which it has placed in the more important offices, and has been requesting, whenever any question of the exact weight arose, that the examiner should actually weigh the applicant. In an endeavor to determine which of the applicants should be weighed we have made use of Doctor Clark's table, and that has been of very great help. Early this year we made an investigation of 106 cases in which the combined chest and girth measurements indicated a greater weight than was admitted on examination. And, based solely on a review of actual weights, our action was changed in fifty-eight out of the one hundred and six cases. In four of these the rating was then decreased; in fifty-four the rating was increased, and in fifty-two no change in rating resulted. This table has proved to be such a valuable index in those cases where the chest and waist measurements are out of proportion to the height and weight that our lay reviewers and doctors now use it regularly in passing upon applications. I cannot help wondering whether all of Mr. Hunter's cases were actually weighed and measured or in what proportion of them the weight was estimated or guessed at by the medical examiner and by the applicant. It seems to me, in other words, that preliminary to the task of actually evaluating the different classes of overweights we must have them accurately weighed, and

I confess that all of our examiners do not yet do that. Do all the examiners of the N. Y. Life and of the other companies weigh all of theirs?

We recall the valuable studies of some years ago by Doctor Weisse and Mr. Strong, of the Mutual Life, of their Company's experience on overweights. They studied the effect of certain impairments and of unfavorable items in the personal and family histories on the mortality of these overweights. They did not try to isolate characteristics that made certain overweights desirable and this would be valuable because, despite their excellent methods of selection, their experiences on these risks on the whole compared to their general experience was not good. Mr. Hunter is inclined to favor those overweights who have a good family history. It would be interesting to know whether he has made studies which show in measured results the effect of a good family history when associated with overweight. Has he answered the question whether an excellent family history gives as much advantage in a case of overweight as it gives in a person of normal weight? It seems to me that definite research on this point is worth while.

Applicants with impaired hearts comprise another large group to which Mr. Hunter refers. The large majority of these applicants, of course, are unquestionably sub-standard or are ineligible for insurance. There is, however, a sizable number of these heart cases, where the murmur is slight and inconstant, and apparently causes the applicant no inconvenience. Our mortality on such applicants with localized apical systolic murmurs is somewhat less than 100 per cent. of the American Men Select Table, compared with 230 per cent. for applicants with a constant transmitted murmur. Our experience is substantially the same as that of the New York Life, as reported by Doctor Rogers and Mr. Hunter several years ago. The favorable mortality among these applicants is still, however, appreciably higher than the general experience of the Company. There are just enough cases among them where the slight murmur is a sign of impending organic trouble to put their mortality above the average, but it does not

seem right to penalize all of them by refusing standard insurance. We are, therefore, keenly interested in the tests of heart function, which Mr. Hunter refers to, now being conducted by the Prudential and the New England Mutual, and we look forward to the results of their experiences during the next few years. In the meantime we at the Metropolitan are using most profitably, on our questionable cases, especially where large amounts are involved, the additional data obtainable by electrocardiographic tracings, X-ray pictures and the laboratory examinations. Doctor Fellows gave some details of this work at last year's meeting.

Applicants with a history of pleurisy afford another example of a border-line group which formerly gave us much trouble. At one time we were inclined to be severe with them, but recent studies of our experience have made us more liberal. Our experience on cases given standard insurance was not much higher than the average. Evidently large numbers of these risks are unquestionably good for standard insurance, although we still hesitate about giving them Whole Life or Term insurance. We do not doubt that many of these applicants did not really have pleurisy, which is so apt to be tuberculous, and that our good results are in part due to that. But for these border-line cases, what is needed is more careful history-taking and more careful examinations of the chest, particularly by a freer use of X-ray and fluoroscopic examinations.

It is my judgment then, that the better handling of these border-line cases, and of many sub-standard cases as well, depends on more actual weighing and measuring of build, more thorough medical examinations and then on further detailed mortality studies. On the one hand, we need more exact information on the real nature and extent of the impairments; on the other hand, we need to know more exactly how both related and unrelated impairments affect mortality; just how little or much improvement we may expect in mortality of various types of impaired lives when there is a good family longevity record or when working conditions are favorable. I think that in our

joint investigations we may not have studied this matter of relationships as much as we will. Such studies present many difficulties, technical and otherwise, but they will prove extremely valuable. The net result of such studies, just as of better examinations, is not necessarily a higher rate of rejection, as Doctor Fellows pointed out last year, but a more accurate action, fairer both to the applicant and the Company. Another result would be to make decisions on border-line and sub-standard cases appear in accord with actual experiences, less arbitrary, and thus we should be better able to resist pressure, because of competition, to accept such cases where experience demanded otherwise.

Another question that I would like to ask Mr. Hunter is whether his present study has shown the proportion of cases of large amounts of insurance on border-line risks that were accepted as standard and can he give us the resulting experiences?

I hope and believe that all my suggestions are essentially in line with and in commendation of the sound and magnificent structure of scientific measurements that for the past 38 years Mr. Hunter and Doctor Rogers have been building to the great and lasting benefit of all life insurance companies and policyholders. We all recognize that their achievements stand high above all others and are of boundless permanent value. May they continue with us for many years that are yet to come.

Dr. Rockwell—I think that Mr. Hunter has covered in his paper, which is exceedingly interesting, things which are of exceeding value to us at this moment, but to my mind it is the future which he indicates and has pointed out to us, because all of us are confronted day by day with these border-line cases. If we assemble data regarding the insurability of these cases and later on perhaps are able to obtain proper mortality experience, that will be of great benefit and great value to us all. I thank Mr. Hunter for his paper.

Mr. Hunter—I find in the Actuarial Society meetings, and it is equally true here, the younger men say that they can't find

topics for discussion. Now there in this one paper which Dr. Knight has given there are three subjects to which you can give thought in cooperation with your actuaries. I haven't seen any discussion which has brought forth so many suggestions.

Here is the first one. He wants to know what our experience has been among the overweights with a favorable family history. Now the job could be divided between two or three younger Medical Directors and Actuaries, the Medical Director selecting border-line cases and the actuary making up the mortality among them. That is a good field for investigation.

Then the second one was, he wished to know what our experience had been among overweights alone that were accepted as standard. Now extend that a little further. Have the younger Medical Directors go over border-line cases that were accepted, and if you do sub-standard business, those put in the sub-standard class. Divide these up and test your mortality. There is another good line of research for two young men.

And there was a third one I noticed in here with regard to the proportion of large amounts of insurance on border-line risks and what the mortality had been among them. That is a very nice field to investigate. Isn't it highly probable that the larger-sized cases would be treated a little bit more leniently than the merits warranted through Agency pressure and that therefore you may have among the border-line cases treated sub-standard a higher mortality than you anticipated by reason of that particular pressure?

There are three different suggestions made for the younger medical men. That is all that I have to suggest at this time.

Dr. Muhlberg—Recently in a round table discussion with perhaps a dozen Medical Directors, we were astonished at the divergence of opinion expressed as to eligibility of applicants giving a history of Encephalitis Lethargica. For this reason, if for no other, a paper on this subject is opportune and I think we are fortunate in having for the essayist, a member who

has handled similarly perplexing problems with scholarly research and rare judgment.

He is also our President-elect and I believe this would be a most opportune time to introduce him and to felicitate him upon the honor bestowed and so richly merited, and especially to congratulate the Association upon its wise choice—Dr. Rowley, of the Phoenix Mutual.

EPIDEMIC ENCEPHALITIS

By Robert L. Rowley, Medical Director
Phoenix Mutual Life Insurance Company.

One year ago at the dinner table, four or five of us, including President Muhlberg, were discussing a number of medical underwriting topics, among which was encephalitis lethargica.

In that discussion it was apparent that none of us had the desired information on which to base a satisfactory prediction as to the effects of this disease.

Whatever the implication may have been, I was asked by President Muhlberg to find out something about this condition and present some sort of information to the Association in a formal way.

My willing assent to this request was with an appreciation of my own need for such study as would be required, and also with a feeling that I would be helped probably more than would others from a survey of the available information on this relatively new and serious malady.

Epidemic Encephalitis is the name now used in referring to an infectious disease of the nervous system that, with less appropriateness, had been called encephalitis lethargica.

Quite as often the clinical picture is that of restlessness and irritability instead of lethargy and somnolence.

While conceded to be of infectious origin, no specific microorganism has been discovered.

The first case to be recognized and described in this country was in New York City in September, 1918.

The disease was recognized in Europe some two or three years earlier. Cases were observed in France by Cruchet in 1915 and 1916; by Urechia in Roumania about the same time; in 1917 a group of cases in Vienna was recognized and very carefully studied by Von Economo, who applied the term encephalitis lethargica.

In a subsequent controversy over priority in recognizing and describing the disease, the claim of Von Economo has much in its favor, because of the character and completeness of his published report.

That the disease may have existed in earlier historical periods there seems little doubt from references in the literature, but positive identification appears hazardous.

The theory has been advanced by Dr. A. J. Watson in the China Medical Journal that during the World War the disease appeared in Europe in consequence of large numbers of men on the various fronts who came from parts of China where, in spite of few reliable historical records, he believes encephalitis has been endemic.

The pathological changes associated with this disease are reported as cellular infiltrations in tissue and about blood vessels, degeneration of ganglion and supporting cells, and proliferation of glia.

The basal ganglia—including the substantia nigra—are the common seat of inflammatory process.

That there may be some relationship of this disease to influenza is a possibility, but the evidence of such relationship is not at all conclusive.

Since 1924 more and more instances of encephalitis attending the commoner infections of childhood are being reported.

Measles, scarlet fever, whooping cough, and other common maladies have thus been implicated, but the largest number of reported cases have attended smallpox vaccinations.

The cause of this relationship is undetermined, and quoting Flexner,—"So far as the encephalitis attending the infectious diseases of childhood and anti-smallpox vaccination is concerned, we must again admit that we are in the region of the etiologically obscure. Whether the inflammation of the brain, which is the basic condition, results from the action of particular micro-organisms including the primary diseases or whether, as seems more likely, it is produced through the operation of secondary or super-imposed agencies, the future must reveal."

The course of this disease and its after-affects upon the individual present a problem of social and economic importance that until recently has failed to be fully appreciated.

While tuberculosis and syphilis may cause many more deaths and disabilities, there is probably no infectious or contagious disease which produces so much consequent ill health and disablement as does epidemic encephalitis in proportion to the comparatively small number of persons attacked.

The story of disaster due to the destructive effects of this disease is by no means told in the reports of deaths, for it is in the after-effects that one sees the distressing tragedies unfolded.

The question in the minds of members of this Association concerns the death rate and quite as much the disability rate that may be expected and also at what interval of time after the acute disease these results are likely to express themselves.

In the extensive literature on encephalitis, the writers have dealt largely with the clinical aspects, the effects of various forms of treatment, and studies on epidemiology, with numerous investigations as to the etiology and some reports on pathology, with but few reports on the subsequent condition of patients who have had the disease.

Probably the most helpful to us of the studies conducted on cases in this country is that by Ziegler reported in the Journal of the American Medical Association July 21, 1928.

By means of questionnaires addressed to patients and to relatives and through reports of attending physicians and by examination of a few patients who returned, he was able to obtain follow-up records at the Mayo Clinic on 752 patients who had had epidemic encephalitis for an average period of five and one-half years.

Ziegler classified the clinical course of the disease in the following manner: The acute stage of three weeks' duration; the residual stage of fourteen or more months' duration, and the stage of chronic sequelae beginning at about the fifteenth month and apparently of indeterminate duration.

In the residual stage, many patients appear well, but in over 25% of Ziegler's cases the condition was described in such terms as "residual fatigue", "weakness", "chronic nervous exhaustion", or "post-influenzal debility". A history of influenza, however, was not given in approximately 35% of his entire group of cases.

The cause of development of chronic sequelae is an interesting speculation, and the question is well presented by Ziegler in this language: "Are the residual stages or the stages of complete recovery periods in which infection is working insidiously to bring about sequelae, or has the infection subsided and does the sequelae later represent degeneration, either as a result of primary injury to the brain cells, or a result of injury to the blood vessels in the acute stage, when peri-vascular lymphocytic infiltration is so prominent in the picture? Most evidence at present points to the hypothesis of chronic infection, and the sequelae are often called chronic encephalitis."

The mortality rate in these 752 patients, traced for an average period of five and one-half years, was 13.2%. The disability rate is shown in the report that only 15.7% of the entire group of (752) patients were able to work regularly; that 25.7% were able to do light work or part-time work, and 58.6% of the cases were unable to do any work. We are reminded that this picture of incapacity and debility may be viewed with a little more optimism than at first appears, as there are presumably a large number of mild cases not recognized and not included in reports of this kind.

The most comprehensive and thorough study that I have found that deals with this subject from the point of view in which we are especially interested is the "Report of an Inquiry into the After-Histories of Persons Attached by Encephalitis Lethargica", by Allan C. Parsons for the Ministry of Health, London, 1928.

A portion of this report is devoted to an analysis of the data concerning some 3,500 patients. "Briefly, the analysis shows that if 100 cases are investigated, say, three years after the primary illness, the *average* findings will be as follows—Patients who have survived without serious consequence, 25; patients who

have died, 35; patients who have become more or less disabled in mind or body or both, 40."

The early or acute stage of the disease may be so slight that there is no illness or at most a light attack of "flu" or a "touch of the flu", and the disease is unrecognized until the late effects or sequelae are manifest.

One estimate in the London report, from which report I shall take the liberty of quoting freely, placed the number of unrecognized cases at from 40% to 50% of the total cases.

"In general hospitals and eye hospitals and other institutions where previous histories are carefully investigated, a retrospective diagnosis of encephalitis is often made in the case of patients who have not been admitted for this disease." ——————"Maudsley, in the Medical Journal of Australia in 1926, noted that 80% of the encephalitis cases seen at the Neurology and Psychiatry Clinic, Melbourne, had not been previously diagnosed as such."

From these and other experiences, it is suggested that for every 100 cases which become notified or reported to the health authorities, 50 to 75 cases are not officially reported.

The London report states that "During the nine years—1919 through 1927—in which encephalitis lethargica has been a notifiable disease, 15,935 cases have been officially reported and 7,632 deaths registered; the mean ratio of deaths to cases for this period is 47.8%."

The mortality rate represented here is too high, as the figures do not include many mild and unrecognized cases nor those where diagnosis was only made late in the course of the disease. Of 452 deaths during 1926, 9.7% occurred two years, 6.9% three years, and 2.6% six years after onset.

From the data given in various tables dealing with the after-histories of cases occurring in different years and in different localities, it may be concluded that somewhere about 25% of the persons reported to have suffered from encephalitis lethargica recovered from their attacks apparently without ill effects.

Information concerning cases from the important cities in the British Isles made up a large part of the above data.

Some observers have put this figure higher and some lower. "Thus, Gardner Robb, who has kept in close touch with the patients coming under his care in the Belfast Fever Hospitals, considers that hardly a patient escapes without some relic of his illness."

Further, Dr. Eric Pritchard referred to an investigation of 300 cases occurring in India in which it was estimated that while 25% of the patients had died, 75% showed sequels of varying severity, —25% insignificant sequels and 50% serious sequels.

The report of the Ministry of Health of London gives in tabular form (Table VI) the results of investigations made in 1926 of 3,558 cases occurring from 1919 through 1925.

There were 1,464 cases with sequels,—41.1% of the total number of cases traced and investigated.

Of these 1,464 cases with sequels, 823, or 23.1%, were unable to engage in any occupation; 410 cases, 11.5%, were unable to pursue their usual occupations; 231 cases, 6.5%, had sequels not serious enough to interfere with occupations.

Other investigations indicate a sequel rate of from 50% to 60%, and the report previously mentioned of the cases in India shows a sequel rate of 75%.

In consideration of all of these investigations, it seems probable, according to the report of the Ministry of Health, that at least half the number of persons who are attacked with epidemic encephalitis suffer from after-effects with a varying degree of corresponding incapacity.

While serious impairments may follow light primary attacks, it has been shown by the studies made that the more severe the primary attack, the greater is the likelihood of impairments of severer grade.

It is worthy of note, however, that "Parkinsonism is a marked exception to the general rule that severity of sequels is anticipated by severity of acute symptoms."

Among the sequels observed, probably two of the most common are insomnia and asthenia.

The list of sequels or late effects may be loosely divided into physical, mental and moral.

Among the physical changes, Parkinsonism and ocular disturbances stand out.

Among the mental changes are disorders of sleep and mental deterioration (dullness, impaired memory, etc.).

Chief among the moral effects is a change of character,—for the worse.

The frequency with which Parkinsonism appears among the after-effects is a little difficult to measure owing to varying standards in classifying and describing the cases, but in one study, presumably representative, it was present in 36.1% of 925 patients. Some studies showed a higher percentage than this, and some a little lower.

Observations as to the period of the disease in which Parkinsonism develops have shown different results. In one series of cases very carefully studied, it was found that Parkinsonism developed during the acute attack in about 14% of the cases. It was found, however, that in the majority of cases of Parkinsonism the symptoms developed between six and eighteen months following the primary attack. Scattered cases developed from three to five years, and at least one case is known to have developed Parkinsonism seven years after the primary attack.

The outlook with Parkinsonism is of course grave. A few cases have made apparent recoveries, but their future remains to be seen. The great majority of these patients gradually become helpless due to physical and often mental deterioration.

Mental symptoms, other than those commonly associated with acute intoxication and fever, often persist after the primary attack, has subsided. When such mental symptoms are not present during the primary attack their subsequent development, probably within eighteen months, may be expected in about 15% of those who survive. On the other hand, of those who show continued or late impairments resulting from encephalitis, about 27% are mental cases.

From the facts available and from such observations as I have been able to gather and record in somewhat staccato fashion, dealing with the late effects of epidemic encephalitis, the watchword

must be one of caution as relates to insurance selection and more especially disability coverage, when we learn that our applicants for insurance protection have had this disease.

If the sequels of epidemic encephalitis are the result of a persisting infection, which now seems probable, the period of viability of the infectious agent becomes of the greatest importance to us.

Naturally, this period will be subject to wide variation in different individuals.

There is some basis for the belief that the activity of the infectious agent is increased by the presence in the host of other active infections.

It is a question whether the brain tissue can be left undamaged by an infection with inflammatory reaction such as occurs in this disease. The variable extent and location of the damaging process finds expression in a wide range of symptoms,—physical, mental and moral.

With our present conception of this disease and of its effects, it would seem that the granting of insurance on the lives of persons apparently recovered must be deferred beyond five years, and our present information offers no good ground for the opinion that they ever become standard risks for insurance.

One could give some weight to the severity of the acute phase of the disease in considering this question.

From the information at hand, it appears that most of the sequels or late manifestations of this disease are noted within three years after the acute attack.

After that period, the cases that develop serious complications leading to death or to disability probably are represented in decreasing numbers with the lapse of each additional year. Of the deaths noted in one year, 2.6% occurred as late as six years after the acute stage of the disease.

As the disability rate is considerably in excess of the mortality rate in the late stages of the disease, the granting of disability coverage should be deferred until observations over longer periods of time may show the wisdom and the safety of a favorable attitude on this question.

DR. BRADSHAW—We, as physicians, have long been familiar with the clinical condition described in text books as acute inflammation of the brain or acute encephalitis, and these terms have been used freely in the past to describe a number of conditions with which we as hospital interns and practitioners were well acquainted.

We remember that there were three fairly definite clinical types of this acute encephalitis: (1) the traumatic, (2) the vascular, (3) the degenerative type. The traumatic type followed the various head injuries. The vascular type was associated with the most virulent and acute forms of the infectious diseases, especially the diseases of childhood, and these severe forms of pneumonia and typhoid fever in adults. Clinicians not infrequently referred to this clinical picture as meningismus. We best remember the degenerative type as the "wet brain" patients who had used excessive amounts of alcohol too long and too freely. In many of these cases—and this should be remembered in any discussion of epidemic encephalitis as well—the terminal effects of repair often lead to atrophy and induration (pathologically termed sclerosis, gliosis, etc.) and the end results offered few or no features to determine the nature of the original disease.

Early in the first epidemic of influenza in 1917-1918 a new type of acute encephalitis was recognized and its characteristic features began to be described in the literature. It was first called encephalitis lethargica. The pathology of this acute inflammation of the brain differed from the long known acute encephalitis in that the chief lesions of acute inflamation were more or less confined to the base of the brain and involved mainly the so-called basal ganglia while the pathology of acute encephalitis involved the gray matter of the whole grain substance. Since the recognition of this clinical entity it has been found that it apparently occurs in epidemic form and that it presents a variety of clinical types. Sequelae are frequent and numerous and there is a marked tendency to recurrence.

A recent monograph by Dr. Charles L. Rayburn written under the auspices of the Fisk Fund for Medical Research cites a few facts that are known and recognized. Though Dr. Rowley has covered this subject so excellently, its importance to life insurance medicine is so great that I will quote the essential facts of Dr. Rayburn's paper.

He says it is now recognized and acknowledged that:

1st—The portal of entry into the brain is definitely limited to the circulatory system.

2nd—Acute encephalitis may occur at any age—even intrauterine types have been reported.

3rd—Occurrence is greater in children and during the years of their great susceptibility to the various acute infections. It is suggested that the larger number of cases reported in adults lies in the fact that a change in the mentality of an adult is more prominent and quickly detected than in a growing child and also that the chronic neurological syndromes of sequelae are easier to demonstrate in adults than in children.

4th—Epidemic encephalitis appears most often to follow the wake of those acute infections, which at their onset, involve the respiratory system, especially the upper respiratory tract and the naso-pharynx.

5th—Trauma, though not a prerequisite is a factor of no small importance and must be considered.

Pathology—The pathology of epidemic encephalitis is described as congestion, edema and numerous inflammatory foci with minute hemorrhages to large ones. This accounts for the large number of described clinical types. Osler's classification according to symptoms seems simplest. He describes three general clinical types:

1st—A general disturbance of the functions of the central nervous system without evidence of focal involvement.

2nd—A general disturbance of the functions of the central nervous system with distinct evidence of focal involvement.

3rd—Mild and abortive cases.

Under disturbances of the central nervous system with focal involvement (2nd) there are subdivisions indicating the region involved such as ocular nerves, region of the pons and medulla, the pyramidal tracts, the cortex, the spinal cord, etc.

Duration—Acute epidemic encephalitis lasts from a few days to months. Not unfrequently the patient slowly emerges from the variety of acute symptoms when he enters into what is recognized as chronic encelphalitis. Chronic encephalitis infers that the inflammatory process is still present and continuous. The severity is indicated by the symptomatology which varies from time to time but which is progressively degenerating.

Post encephalitis is that process or clinical syndrome which remains after the acute and chronic inflammatory processes have ceased. This condition gives a constant non-progressive symptomatology. The symptoms merely indicate the presence of an organic lesion of the central nervous system. Post encephalitis may show symptoms and physical signs that are dormant for years. When the symptoms or physical signs progress we know that the chronic encephalitis is more or less active again. It should be realized that the post encephalitis syndromes are caused by the scars of the acute and chronic forms and it is most important to remember that these foci of chronic inflammation may be dormant for months or years.

Prognosis—We must all agree with Dr. Rowley that the prognosis is distinctly bad and must be guarded. As he points out, and the authorities agree, the prognosis is unusually grave due both to the high mortality and the serious nature of the sequelae. Wimmer states that "Surprising" is an admirable epithet for this disease and that at present a reliable forecast cannot be given.

Burr writing in the American Journal of Psychiatry summarized his paper by stating that epidemic encephalitis is that mysterious disease, the real cause of which is still unknown,

which remains dormant for many years, recurs at long but irregular intervals and leaves after each outbreak a trail of broken minds and crippled bodies.

In my company, The Mutual Life of New York, we have been recording epidemic encephalitis as a separate cause of death only since 1927. Our mortality summaries show that in 1927 we had 21 deaths from this disease. In 1928, 20 deaths and in 1929, 13 deaths; a total of 54 deaths or .2% of our total deaths. This gives a rate of 2 per 100,000 exposed to risk. The average age at death was 47 years. The shortest duration of the policies was 6.7 years and the longest was 14.1 years.

Our disability experience is from 1918 to 1929. During these eleven years we have approved 115 disability claims for encephalitis in some one of its many phases. Of these, 17 have died and only 18 have recovered, leaving 80 on our books as still disabled. Of the 17 dead, the average duration of disability was 32 months and of the 18 recovered, the average duration of disability was 25 months. After reading Dr. Rowley's excellent paper and reviewing the recent literature, I feel that the prognosis for our 80 remaining claims is absolutely undeterminable and hope for termination by recovery almost impossible.

Dr. Dingman—It is a pleasant privilege to discuss the paper so concisely prepared by Dr. Robert L. Rowley. The subject matter is timely and the presentation in the manner that we associate with the essayist.

Epidemic encephalitis has a double seriousness in insurance: one, the unusually high rate of sequelae; the other, the large number of cases that go unrecognized. Without doubt many a so-called influenza with out-of-proportion prostration is epidemic encephalitis. These risks are going on our books because the ailment is unrecognized as such.

Frankly diagnosed cases are those with clearly established pathology, and such applicants and policy-holders as we have with history of epidemic encephalitis fall definitely in the groups whose after-histories have been studied by various clinicians. Re-

ports on end-results are in uniform agreement that it is the exception when an individual makes a complete recovery from epidemic encephalitis. The consistently high rate of sequelae suggests to Lloyd H. Ziegler (Jl. Am. Med. Assn.—91-138-1928) that the ailment is a chronic infection, in which event the so-called sequelae are not sequelae, but are manifestations of a disease that persists in chronic form. In his series, only 16 per cent. got entirely well. In Parson's report on late results, 25 per cent. survived without serious consequences. In 1927 I made a brief review of the literature (Insurability, Spectator Company, 1927, p.423) and learned that Bing and Staehelin reported 25 per cent. as completely recovering, Palitzsch 20 per cent., Cruchet 14 per cent., Adler 13 per cent. It was F. O. Hess' opinion that complete recovery is seldom made.

It appears reasonable to believe with Harold S. Hulbert (Ill. Med. Jl. 58-121-1930) that the disease is a progressive affair with exacerbations that may be brought about by factors such as alcoholism, head injuries, and even by emotionalism. "I regard this disease, as far as its progression goes, as midway between general paralysis and Huntington's chorea. Therefore, ten to fifteen years would be the average expectancy of life of a case after surviving the acute stage, the last years being spent in a paralytic and somewhat demented state . . . . . we must consider the prognosis not at all good for improvement and not good for normal expectancy of life and not at all good for social and economic adequacy."

It becomes exceedingly doubtful if a person who has had epidemic encephalitis can ever be considered a standard risk for life insurance, certainly not within five years. Nor can he be considered eligible for disability insurance, not within ten years. The suggested five and ten year time periods allow demonstration of complete recovery in occasional undoubted cases, and allow, also, presumption of mistaken diagnosis in occasional disputed cases.

DR. VAN DERVOORT—I wish to direct my discussion of Dr. Rowley's excellent paper to the question of morbidity rather than mortality. Given a history of encephalitis lethargica, we are fairly of one accord, I believe, as to its treatment from the standpoint of selection for insurance. A period of waiting, varying from five to ten years is commonly practiced. These cases, however, never qualify for disability insurance. Let us note especially three conclusions of much consequence in Dr. Rowley's paper:

A. That at least one-half the number of persons who are attacked with encephalitis lethargica suffer from after effects—

B. That Parkinsonism is an after effect in probably 35% of patients having the disease—

C. That the symptoms of Parkinsonism develop anywhere from six months to a number of years after the primary attack.

I assume that these figures are based on the groups in which a primary diagnosis of encephalitis was made.

But what about the many cases of the Parkinsonian State of chronic encephalitis in which the primary attack was not properly diagnosed? Here is our problem and our danger from the standpoint of disability insurance. It has been proven in most instances in which the Parkinsonian State has developed, a former history of impairment can be recalled by the patient. Such histories include a:

"Mild Influenza,
"Grippe, a year or two ago,
"A run-down condition."

The impairment, however, was not in accord with the diagnosis as the state of Parkinsonism is not an after condition of such impairments. What the individual did have was—encephalitis lethargica. How is this condition of affairs going to influence our disability experience? The possibility is somewhat

alarming, but the infant is too young and consequently the experience too short to permit a conclusion. Nevertheless we have a new problem in disability insurance which we will agree must be scrutinized carefully.

Unfortunately it has not been the experience of many of the members of this association to have the opportunity of personal observation of patients with this disease, but our clinical colleagues are diligently investigating and constantly broadcasting their results for our benefit, as well as their own.

Just one year ago I had the good fortune to see a reel or two of motion pictures relative to the early diagnosis of the Parkinsonian State, shown at the regular meeting of the Association of Life Insurance Medical Examiners in Philadelphia, by Dr. A. M. Ornsteen. Dr. Ornsteen is neurologist to the University of Pennsylvania and the Philadelphia General Hospitals in Philadelphia. He has had the opportunity of observing hundreds of cases in which the diagnosis of Parkinsonism has revealed a previous history of undiagnosed encephalitis. When Dr. Rowley asked me to discuss his paper, I immediately recalled the impression the pictures had made. Through the courtesy of Dr. Ornsteen I am to share with you the interesting and enlightening study. I only wish the Doctor himself were here to describe it.

Dr. Ornsteen and Dr. Spiller, of the same clinics, lay special stress on a group of symptoms (the Triad) which they believe to be the first manifestations of early Parkinsonism. The observation is made in the hands of the patient and are classified as follows:

1. Finger posture in repose,
2. Finger spacing of the out-stretched hand,
3. Thumb-forefinger test.

Let me describe briefly using enlargements of Dr. Ornsteen's original pictures:

Sign #1. The patient stands at attention thoroughly relaxed, the hands hanging at the sides. Normally the palm face the

thigh and the fingers are slightly flexed at all joints (figure 1). In early Parkinsonism, the hand of the affected side shows an increased degree of flexion at the interphalangeal joints (figure 2).

SIGN #2. Have the patient fully extend both arms in front, palms down. The spacing of the fingers is usually uniform and symmetrical and if either adduction or abduction of the fingers is present it is equal in both hands of a normal individual with very slight variation. The position of the thumb does not matter (figure 3). Definite asymmetry between the two sides is present in the abnormal state. The affected hand shows greater irregularity (figure 4).

SIGN #3. Have the patient hold both hands upright in front of the face, and close all fingers in the palms except the thumb and the forefinger. Then ask him to rapidly touch the forefingers to the thumbs with wide excursions. The result is symmetrical in the normal individual (figure 5). If abnormal there is noticed definite limitation of agility, reduction in amplitude of the movement and early exhaustion of the affected side (figure 6).

Later on more easily recognized signs appear, such as the characteristic facies, ocular symptoms, loss of associated arm swing, etc.

I believe it would not be consistent, or even possible, for us to expect our examiners throughout the country to observe each applicant who has had, say, influenza for this Triad of symptoms. On the other hand, however, taking for granted, as I believe we must at the present time, that the Triad of symptoms described above are the very earliest manifestation of the Parkinsonian State, we can in certain cases where we have some doubt refer back either to our own examiner, if we think he is qualified, or to a competent neurologist for sufficient study to eliminate the presence of the Triad. It is quite manifest that we do not want on our books cases in which there has been a history of encephalitis lethargica until the proper waiting period has elapsed.

nor do we want those without such history but with beginning Parkinsonism, either for regular or disability insurance.

Now I am going to show you some pictures and I wish Dr. Ornsteen were here to do it and to describe it. I can not do it, but I am sure you will be interested. One of the reels takes up in detail this Triad of symptoms which they place so much reliance upon and the other picture takes up the disease in the advanced stage.

(Showing of pictures.)

Dr. Rowley—Mr. President and Members of the Association: The discussion has brought out so much of interest and importance in connection with this paper that I want to express my personal pleasure and gratitude to those who have taken part in this discussion, Dr. Bradshaw and Dr. Dingman and especially Dr. Van Dervoort with his moving pictures, which have given us such an intimate view of the clinical signs that we may expect in this group of cases.

In preparing this relatively short paper on "Encephalitis," I have adhered to the purpose I originally had in mind of trying to find out, if possible, what the facts are concerning the after histories both in terms of death rates and of disability rates in encephalitis cases. I have not included a great deal of interest that might have been included having to do with the excellent research work that has been done in attempting to discover the cause of this disease, nor have I included anything except the briefest reference to the symptomology and the clinical signs. I left the field pretty wide open for the discussion to bring out that phase of the subject.

The picture that one gets from a study of this disease is indeed a distressing one and the more recent literature brings even more distressing pictures than one saw in the literature of a few years ago. I referred in my paper to two researches that seemed to be especially helpful in furnishing the fact that we were seeking. One of the most extensive works in research and study that has been made of this disease makes up the substance

of the report of the Matheson Commission, which was published by the Columbia University Press in 1929. In that report the commission collected information in regard to this disease from every part of the world. They were able to get together records of 7,876 cases, in which a fatal result occurred in 3,980 instances, giving a mortality of a fraction over 50 per cent. That, you will remember, is a rather higher mortality than was found in the investigation made of the cases that occurred in the British Isles and to which reference is made in my paper.

If one wants to find some interesting reading and plenty of it on the subject of encephalitis, he will find in the Matheson Report a bibliography alone that covers some 430 pages. So one can sit down and have a real busy time if he reads all that has been written on this subject.

I have been well repaid for the study that I have made in my attempt to find out something about this condition and hope those who take time to read the paper may find in it something of value in our work.

Dr. Muhlberg—Aviation is not properly a medical question. The selection is usually delegated to Underwriting Divisions. But inasmuch as Medical Directors of smaller companies, who do not have Underwriting Divisions, or Medical Directors of many Companies who are members of Underwriting Committees must necessarily keep abreast of the changes that occur from year to year in aviation hazards, I think a paper on this subject is germane. I call on Dr. Sykes.

THE HUMAN ELEMENT IN AVIATION

By Dr. Lawrence G. Sykes, Medical Director
Connecticut General Life Insurance Company

It appears to me that, as Medical Officers in Life Insurance Companies, we must be keenly alert to the human element involved in aviation represented by the physical condition of the pilots and the mental attitude of pilots, operation managers, and executives. The human element plays one of the major roles in this large industry, as evidenced by results thus far secured. It has been authoritatively stated that most of the losses in aviation may be attributed to negligence, carelessness, or over-confidence. This is represented in crashes due to flying in bad weather, to careless and over-bold flying, to foolish flying and to stunting. It has not been in the majority of instances due to disability of the airplane itself, but due to the failure of the human element involved, whether he be the pilot, operation manager, or executive. To illustrate, I quote the Department of Commerce figures, published in the Air Commerce Bulletin:

COMPARATIVE TABULATION OF ACCIDENTS, CIVIL AERONAUTICS FOR YEARS 1927, 1928, 1929

Causes of Accidents

	Jan.-Dec. 1927	Jan.-June 1928	July-Dec. 1928	Jan.-June 1929	July-Dec. 1929
Personnel	52.86	46.74	57.97	59.04	55.75
Material					
Power Plant	14.50	16.59	15.74	18.08	18.95
Structural	8.86	5.76	4.72	8.80	11.26
Miscellaneous	18.20	24.13	12.12	9.35	8.47
Undetermined	5.58	6.78	9.45	4.73	5.57

In the above figures, classified as "miscellaneous", from four to ten per cent is given as due to weather. It is not unreasonable to believe that there were errors of human judgment involved in this group.

A medical officer of the United States Navy, speaking before the National Aeronautical Safety Conference, stated that an analysis of crashes in the Army and Navy showed that "Eighty per cent of the fatalities which have occurred during the past seven years can be traced directly to personnel. In other words, the human and not the mechanical element is most often subject to failure."

Let us consider the physical aspect first. Sound physical condition is more important in flying than in any other occupation. Flying is attended by very severe strain and stress on the physical and nervous system. Where there is too much daily flying, too much dissipation, and lack of exercise to keep physically fit, there is produced air staleness. This is made evident by irritability, loss of interest, insomnia, fear of the air, failure in flying ability. It is interesting to note that the Army has found that staleness is approximately thirty-three times as great among the Air Corps as among officers of the rest of the Army. This is good evidence of the stress that the flying personnel is subjected to, in comparison to non-flying occupations. The close medical supervision in the Army and Navy partially offsets the extra hazards that are involved in military maneuvers and aerial acrobatics, which are a part of the training. You may ask what this has to do with life insurance underwriting. In my opinion, the extent to which this supervision of the flying personnel, both as to their physical condition and their mental attitude, is watched and guarded, and both demanded—to that extent will there be safety in the transportation of the flying public. Some of the transport companies realize that too much flying decreases the efficiency and lasting abilities of the pilot. They therefore carefully control the amount of flying done per week. The passing of a six months' physical examination today is no guarantee for the intervening time until the next physical check-up, six months hence. The cooperation on the part of the pilot and the industry in this connection is therefore all important. In can be safely

asserted that all companies carrying passengers are not carefully supervising the physical condition of their flying personnel.

The increase in speed of airplanes adds one more danger to the pilot. Unfortunately, little is known about its effect upon the individual. It is recorded that fliers have complained of dizziness and faintness when making sharp turns at high speed.

During the last fiscal year, 44,000 examinations were made under the supervision of the Department of Commerce by some 800 examiners. In the main this work has been satisfactorily done within limitations and it can be expected that wider experience will naturally strengthen this service. It must be remembered, however, that pilots are examined every six months and unless there is careful personal observation, conditions can materially change in the meantime. I think we will all have to acknowledge that the physical condition of all pilots has been taken for granted by life insurance medical officers. I believe that even some companies are taking Army and Navy pilots non-medical with extra premiums, because of this fact. Recently, a prominent actuary made the statement that "It would be worth considering having doctors with experience comparable to flight surgeons make examinations, so that special attention might be paid to the condition of the pilot's nervous system and to his eyes". Frankly, I have confidence in our medical examiners.

I want to relate a recent experience that occurred in our office. We received an examination of one of our policyholders, which was submitted for the purpose of adding our most liberal Disability. Our chief examiner found that the patellar reflexes were absent, the pupillary reflexes sluggish in their reaction to light, and that the individual definitely swayed when standing with his eyes closed. In view of the confidential information submitted to us, it was deemed advisable to have an outstanding neurologist make an examination. He found that there was no ankle clonus,

no Babinski, the Romberg sign positive, and the pupillary reflexes sluggish, with a very definite suggestion of a fixed pupil. In addition, he secured blood for an examination which showed a four plus Wassermann reaction. It developed that he was contemplating going to an army camp for his annual reserve flying service. When the results of the examination were secured, he was urgently advised not to fly, in view of his condition, and to immediately institute treatment. However, in the meantime he had been passed by a flight surgeon and certified for active flying service. It was later ascertained that he flew daily during this training period. It was just chance that an unexplained, mysterious crash did not occur, in view of his physical condition.

I understand that but one state requires a Wassermann Test of pilots and that the examination for a Federal license does not require such a test. While one case does not prove a point, I maintain that if it is acknowledged in the industry that sound physical condition is more important in flying than in any other occupation, that a Wassermann Test is imperative for the protection and safety of the passengers who use aerial transportation and whose lives are in the hands of the pilots.

The mental attitude involved in aviation, our next consideration, is probably the most important angle of the whole problem. It is one that as underwriters we are all becoming aware of, consciously or unconsciously, as we learn more of the industry. It is likewise a most difficult aspect to ascertain in evaluating a risk, whether it be a pilot or a transport company. We know that all transport companies are not in the same class. In some, safety is the prime factor, and there are others in which maintenance of schedule overshadows safety.

An analysis of the situation gives us considerable light. A pilot has the feeling that he is not quite like other individuals as he is a pioneer in a new field of travel, and that he is of a generation which is conquering the air and blazing the trail for future generations to travel. He is doing something new,

adventurous, something daring. Let us stop and think what type of individual this would appeal to. The added appeal of big money was lurid bait to the daring. Please do not misinterpret my remarks, for I have the greatest admiration for the pioneers of the air, nevertheless, we must understand the usual type. It was their daring and bravery which has brought aviation where it is today. It has been said that "Aviation was built on courage, on self-sacrifice, on the bodies of dead pilots".

During the last ten years, aviation has arrived and the public is watchfully waiting to have its safety demonstrated. The attitude of bravery and daring is still hindering its progress. "In what way?" you ask. In the competition between lines and in the competition between pilots, there still exists that feeling that schedules must be maintained and that it must be demonstrated that one can do something that others cannot do. We must not forget the human element and the human reactions of an average individual. Bravery is admired by all. The deeds of experienced pilots are an incentive to the new pilot. When he leaves the ground, he is master of his ship and his native instinctive judgment is all important, as is the attitude of the operation manager. If the latter sarcastically insinuates that the pilot is timid, in the face of questionable weather, or that another pilot is anxious to fly—you know the result—chances are taken which are not justified. This leads me to the responsibility of the transport companies. Maintenance of schedules and competition between airlines has been a factor that has sent airplanes on their schedule in bad weather, when safety was not assured. Many crack-ups can be definitely laid to this one factor. The industry must acknowledge the limitation of air travel until safety can be assured. Until that time, pilots, operation managers, executives, must face their problems and jointly demonstrate safety. This can be well illustrated on the part of several of the best transport companies, where the strictest sort of discipline is maintained. In these companies, there is no lack of harmony, nor of effort to insure safety. Their results tell the story of their efforts.

In this connection, it is interesting to know that one large transport company has a chief pilot whose duty is to know intimately his pilots, their families and the family situations. It is his duty to ground a pilot if he shows evidence of staleness, is worried over sickness at home, or any other disturbing factor. Their foresight has been rewarded in results obtained.

In this complex situation, it is easy to understand and to explain careless flying. That feeling of mastery of the situation makes the daredevil take chances which safety does not warrant. Chances are taken which are not justified by the experience of the pilot. In passenger carrying service, if recognition and reward were given pilots for safe flying, so that there is a premium on a good record, accidents would be materially diminished. Hand in hand with this, if the careless fliers were discharged and it were made difficult for them to secure work elsewhere, they would prize a good record.

One cannot help but wonder whether our method of training pilots in this country may be speedy and not thorough enough in fundamental knowledge and experience. It seems doubtful whether in the limited training time the actual ability of the prospective flier can be gauged. It is necessary to remember that experience does not insure ability. We have labored under the delusion that ability increases directly with experience. The mental equipment of the individual must be taken into account. In the last eleven years in Germany, for example, 200,000 individuals, mostly youngsters, have been taught glider flying with two deaths. In the last year or so in United States, with a few hundred actively engaged in this sport, thirteen have been killed. Take the training of pilots in that country. They spend one year in the manufacturing plants, building airplanes and motors. Another year is spent in mastering the art of gliding before they start their active flying training. The penalties are severe for even minor accidents during their training period. If they have a certain number of accidents, the preliminary training has to be taken over again in its entirety. The safety factor becomes instinctive. That training eliminates the hero complex, elimi-

nates the unfit, both from the angle of physical inaptitude, as well as mental attitude. A frequent approach to flying in this country is training from May until October. The experience gained is fair weather flying and the mental attitude savors much of the hero complex. The care with which our best transport companies are approaching the whole problem of selection of pilots and their supervision, weather reporting, control of ships, promises much for the future. Their records speak volumes.

The human element from an underwriting standpoint must be taken into careful consideration in evaluating the aviation hazard. A personal incident occurred in September, 1929, which I believe clearly indicates the problem that we have been confronted with and also shows the attitude of many in the industry itself. I was invited to attend a conference of aviation traffic officials and to act in an advisory capacity on their Insurance Committee. The one question asked me most frequently was—"When are Life Insurance Companies going to liberalize in their attitude toward air travel?" My answer was as follows: "Would you go down to the airport here and get into the first plane with any pilot and travel?" The usual reply was—"Certainly not, I am more particular than that, being in the industry." Then I countered—"Yet, you want the Insurance Companies to do that very thing, cover any and all conditions." They want to know the pilot and the ship when they travel and we likewise want to know these facts in underwriting.

Dr. Muhlberg—In introducing the next speaker, I can do no better than to quote from a letter written by Dr. Sykes:

> "Major Reed M. Chambers was one of the United States Air Corps' leading aces during the World War. He was cited four times for the Congressional Medal of Honor, four times for the Legion of Honor and four times for the Croix de Guerre. The Company with which he is associated as Vice-President has inaugurated a Safety Campaign within the industry and

there is no one more familiar with the human element in aviation, both from experience and knowledge of the industry, than is Mr. Chambers. His Company is one of the outstanding companies handling Aviation underwriting for all lines, except Life Insurance, in the country today."

MR. CHAMBERS—Gentlemen, it is my understanding that when you doctors have a patient afflicted with a mysterious ailment, one of the first things you do is take him apart to see what makes him "tick."

Aviation renders too great a service to go backwards. It will advance even more rapidly in the future than it has in the past but I feel that much can be accomplished for its more rapid advancement by a frank discussion of some of its ills between you gentlemen here today. That it has several very serious maladies at the moment we all know, but unfortunately most of us in aviation are hesitant in admitting this.

Although I am in the insurance business, I would like to make it clear that I am at heart all aviation. The fact that I am combining Insurance with Aviation has caused me to take the ills of aviation a lot more seriously than the average man in the industry, I believe. In fact, I have spent many hours trying to analyze in my own mind the background and reasons for some of aviation's worst afflictions.

It is probably true that one of the greatest retarding influences to every new science or industry is the fact that those who are most familiar with them are unable to talk a language that is understandable to those whose help is most greatly needed.

I cannot turn this into a medical discussion but I know you gentlemen *know* I can't. Therefore, without any thought of being facetious, I ask that we hold a consultation over our patient, Aviation, here today.

As I understand it, the first procedure is that you make a study of the patient's history.

History tells us that the thought of flight through the air was in the mind of Man before the birth of Christ. Its paternity was mixed. We know that the period of gestation endured for hundreds of years and that flight first came into being in the form of a hot-air balloon, and, through process of evolution, which included lighter-than-air gliders, attempted helicopters and many other queer contrivances, developed into heavier-than-air flight when the Wrights flew at Kitty Hawk in 1903. We may therefore place the age of our patient of today at about 27 years.

The development for the first few years was slow, as our patient was the subject of the greatest suspicions and fears on the part of all but a few. Those few today are termed scientists but were in those days called "nuts." These early environments caused aviation to acquire some very bad habits. Unfortunately, these habits still endure.

Flying always has and probably always will require a fairly high degree of skill. During the first few years of aviation, the man who had acquired this skill found that the only way it could be profitably utilized was by displaying it to an amazed and admiring multitude. Showmanship therefore entered, and in order that the early pilot could obtain the maximum amount for his services, every trick known to showmanship was resorted to in order to convince the public that they were witnessing an exhibition by a super-man.

While much of this "bunkum" still exists, we must realize that our present generation remembers when man first flew in heavier-than-air craft and the early impressions gained of aviation as the result of its showmanship not only make this generation hesitate to become air-minded but also cause many who are now entering aviation to believe that such methods are part of the game and in order to be successful they must emulate the old timers.

This forms a background of one of the ills we find aviation suffering from.

When our patient was only 11 years old, the World War began. The effect of the War on aviation was both as good and as bad as it has been on the rest of the world. The war unquestionably hastened the development of aviation tremendously but at the same time, it furnished a start for what I prefer to term a "deformity" in the character of aviation, exactly the same as it developed a deformity in human nature in various parts of the world, making for the 18th Amendment, gangsters, Bolsheviks, etc.

This deformity could be diagnosed as a "subnormal sense of fear" and I should like to express a theory on how this developed. The fellows who went into aviation in this country in the Spring of 1917 were much like those who had entered military aviation in other countries during the two or three years previous. They were no different from the young men going into any other form of military life, except possibly they were put through more rigid physical examinations and were more carefully chosen from the standpoint of temperament. They went into aviation with the full realization that the fatality list in this particular branch of service was greater than that of any other but they were perfectly willing to accept these additional hazards in return for the additional glory which came through publicity and for an opportunity to fight colorfully as an individualist, like our forefathers fought Indians, rather than as only one unit in a big machine.

There were times during the training period of every individual student in aviation when fear entered in no uncertain way. As a general thing, however, each succeeding step in the flyer's training during the war period was so gradual that he himself had no realization of his advancement and when fear *did* overtake him, it was only in a fraction of one per cent. of the cases that the student backed down and allowed fear to overcome his fear of being called afraid.

During the time over the lines, the military aviator was subjected to hazards as great as, if not greater than, those in any other form of warfare insofar as he as an individual was con-

cerned and in most instances it was through the exercise of his own will-power that he carried on, rather than as the result of direct orders on the part of an observing officer. As time went on these conditions became commonplace and things that would have frightened him badly a few months before became a matter of daily occurrence and therefore lost much of their meaning. He unquestionably became not a hero but an individual who was oblivious to danger. To my mind, therein lies the reason back of another of our greatest handicaps to aviation—this deformity called the "hero complex."

If this same war pilot is still in aviation today, he is probably one of our safest pilots because he has long since come back to a realization of the ever present hazard of making a mistake or taking unnecessary chances, but as the result of his attitude shortly after the war, plus newspaper publicity and notoriety (much of which has been exaggerated), other young fellows have come along who in too many cases have been led to believe that in order to be good pilots they must emulate the pilot developed under war conditions.

While our new pilot has not had the environment and surroundings that would naturally bring about this devil-may-care attitude as did war conditions in 1917 and 1918, he has nevertheless perpetuated the deformity and, in fact, has caused it to develop into even more serious proportions in that it is now, in addition to being a hero complex, a fear-of-fear complex as well, and this being afraid to be afraid has, to my mind, caused more loss of life than any other one condition in aviation.

In order to prove this, I ask that in the future you analyze every aviation accident with this thought in mind. I believe you will find, as our experience has quite definitely shown us, that the majority of accidents are, in the final analysis, due to the fact that the pilot was afraid that someone would think him afraid or let us use the term "yellow." It has caused him to go on when his own better judgment told him to turn back. It has caused him to go up in equipment he knew was not in condition. It has caused him to perform acrobatics close to

the ground which he knew was exceedingly dangerous and, if the truth were known, he was probably frankly admitting to himself that is was dangerous at the moment he was killed.

This deformity, in addition to costing this baby industry hundreds of lives and millions in equipment every year, has had a still more harmful effect, that of frightening away its very source of livelihood, traffic. If the true story could be told of every airplane accident, the hero complex would quickly disappear because the pilot's fear of being called seventeen kinds of a fool after he was dead instead of being applauded as a heroic young man would, to my mind, more than outweigh his present fear of being called afraid.

But here we run into the old sentimental theory that no ill may be spoken of the dead, and the fear of the law of libel. We dare not tell the truth because we will be condemned as either heartless wretches or as low commercial libelers of the dead. Therefore, we all keep our mouths shut and pretend that every dead aviator is a dead hero and has been killed either by poor workmanship, bad weather or some sudden unknown danger of a mysterious nature.

I realize that if by any chance my statements here today should become known to my friends in aviation that I would be considered untrue to my kind, but, nevertheless, until there is some way of arriving at the truth, aviation is bound to continue to suffer.

These deformities, cancerous growths, or whatever you doctors prefer to call them, have caused aviation first to be misunderstood by the public and second have caused aviation to misunderstand the public, with the result that we go back to one of my first statements, that aviation seemingly finds itself as unable to talk the language that the public can understand as I would find myself to understand you gentlemen if you talked to me on medicine.

Everyone in aviation has had a subconscious knowledge of the conditions to which I allude. Unfortunately, many of them have never seriously attempted to make a thorough analysis of

what brought these conditions about but instead have attempted to make the public airminded by resorting to slogans and hiding their heads to the fact that a real danger did exist.

The word "safety" up to last January had been a word taboo among the aviation fraternity. Pilots and executives alike felt that any allusion to the necessity of greater safety in air transportation would frighten the public. They could not realize that the public would accept safety measures in aviation the same way as they accept life-boat drills on steamships.

Many passengers and pilots have been killed in the past five years because safety belts were not worn. Up to a year ago, safety belts were purposely left out of all passenger carrying aircraft because the industry felt they would have a bad psychological effect on the public. During the past year many attempts have been made to force the industry to equip every seat in every aircraft with a safety belt and to issue instructions that they shall at all times be used.

The industry is still hesitant in carrying out this idea, however, with the result that every few months we read of another death that would have been averted had this simple expedient been made use of.

Our experience in analyzing losses over a period of two years convinced us that the theory I have tried to put across to you here today, plus the industry's seeming lack of intelligent effort toward enforcing the few simple rules that would materially increase safety, necessitated some very direct action and, as a result, we inaugurated a Safety Campaign to the personnel of the industry the first of this year.

We took as our objectives at that time two things. One was to convince the industry that the public could not be sold the idea that airplanes were safe as long as they were able to read of air catastrophes in their daily newspapers, and to convince the industry that the public would accept the introduction of safety measures into air transportation in exactly the same spirit they have accepted life-boats, fire drills and various types of safety equipment in other forms of transportation.

Our second objective was to give the thinking pilot sensible reasons why he should not be afraid to follow his own better judgment rather than to fly into what he knew to be a dangerous situation because someone had done it or he was fearful that someone would call him "yellow" if he did not.

We announced our intention of attempting such a Campaign by a personal letter to 603 executives of the aircraft industry. We stated very frankly that in our opinion aircraft insurance rates were so high that they constituted a heavy drag on the progress of the aviation industry, but that high as they were, they would go higher unless crash and fire losses could be materially reduced. We furthermore stated that the member companies of the United States Aircraft Insurance Group had confidence in the future of aviation when the Group was formed and that that confidence had grown with the growth of the industry, and that we did not believe that increasing rates could do more than impede needlessly the progress of aviation.

We told them that we were convinced that the majority of losses in the aircraft industry were due to negligence, carelessness or over-confidence and that we believed that some constructive work in the reduction of such losses would in a surprisingly short space of time reduce aircraft insurance rates.

We assured them that our releases would be confined to the aircraft industry, but despite this, many in the industry wrote to us expressing deep concern or fear that a frank discussion of some of the troubles of the industry would react very unfavorably toward aviation. This we had expected but we determined that we would chance the criticism of the industry in arriving at the truth.

After the first few releases, the same individuals who were fearful that our Campaign would do more harm than good started writing us congratulatory letters and asking us to keep up our good work.

In the past ten months we have received over 5,000 letters from executives and personnel of the aircraft industry, thou-

sands of them containing excellent suggestions and none of them voicing a criticism.

While it is too early to be very definite as to the value of the campaign which we have carried on, we are sufficiently impressed with what has been accomplished to continue along these same general lines. The loss ratio so far this year is greatly improved over the same period of any preceding year since commercial aviation has been at all active, and, while we do not accept any major degree of responsibility for this condition, we are convinced that the campaign has caused every thinking pilot to take an inventory of his own qualities.

Flight surgeons throughout the country have for years recognized the value of the study of pilot psychology. It has been only during the past year or two that the executives of the industry have been at all sympathetic with their theory.

Several of the largest air line operations are now giving as much attention to the physical and mental condition of their flying employees as they are to the type of equipment they are buying.

One line is insisting upon a complete physical examination of every employee—this goes for mechanics as well as pilots. Furthermore, they are insisting that every chief pilot of each division be familiar with the mental condition of every pilot under him. This condition has been going on for over a year and what started out as an experiment has proven of value to such an extent that this particular operation is spending much time and money on developing a personnel of the very highest physical standards and on maintaining a thorough knowledge of the mental attitude of their flying personnel at all times.

Although they are operating in excess of 18,000 miles a day, this air line has operated for nearly three years with only one accident where loss of life was involved.

Dr. Wade Hampton Miller, a flight surgeon of unusual ability, has given a most complete study to the psychology of the flying personnel of another large air line. A paper of his was recently published in the June issue of "The Journal of Avia-

tion Medicine" and I recommend that you read it as it covers the subject in an excellent manner.

It may seem to you gentlemen that I have gone rather far afield in attempting to discuss theory with you. I have talked it individually with many doctors who are in intimate contact with the industry and while it has no direct bearing in the interest you gentlemen have in aviation, I believe that you are in a particularly strong position to help bring about the needed changes.

Your medical profession, I believe, will give you a more sympathetic understanding of some of the problems aviation faces. Your interest in insurance gives you a weapon which is stronger than any other I know of in helping to enforce these needed changes.

While the majority of you take no interest in aviation from an underwriting standpoint at the moment, you are vitally interested in how the aviation hazard enters Life Insurance. I doubt that there is a single Life Insurance Company represented here today that does not have a policy-holder making an airplane flight somewhere in the country today and, I repeat, Aviation renders too great a service to go backwards. It will advance even more rapidly in the future than it has in the past.

The Do-X which will leave Europe in a few days for a trip to the United States has carried into the air at one time a total of 169 persons and, while I feel that it will be several years before planes of this size are in regular operation, most of us will live to see them as a commonplace means of transportation and then the aviation hazard will be a very vital factor in life insurance underwriting, regardless of whether life insurance companies are writing the personnel involved or not.

Gentlemen, I have expounded a theory as to the reasons for some of the ills of aviation. I believe the next step to be taken is a suggested cure.

I believe that the cure lies in the proper education of the youngsters now growing up. I think that our whole educational system should now recognize its responsibility to this

younger generation, first, by recognizing the fact that they are going to fly regardless of whether it remains as hazardous as it is now or not, second, by taking the necessary steps to overcome the various hero complexes that aviation has built up within itself, and third, by taking the "mystery" out of aviation for the benefit of those who come after us.

I am firmly convinced that the Theory of Flight, together with some Meteorology, should be a part of every high school curriculum. I furthermore think that we could well take a page from Germany's method of furthering the advance of aviation and that is teaching the youngster practical flight through the use of gliders.

Germany has proved through the training of thousands of youngsters in gliding that it can be done safely. This is not only an inexpensive method but is a most proficient one as well, as the thoroughly trained glider pilot can learn to fly a powered plane in a very few hours.

One of the first requirements will be to make the youngster realize that flying cannot be learned in a few weeks any more than can medicine. A thorough knowledge of flying comes only through experience and experience can be obtained only over a long period of time by flying various types of equipment under varied conditions in different sections of the country.

You gentlemen may feel that I have made a poor case for aviation but I know that you have read and have heard from many sources about the safety of air transportation, and I know that like other discriminating people you not only have accepted such statements with certain mental reservations but some of you have frankly disbelieved them.

I believe most of you subscribe to the Darwinian theory and believe in throw-backs. Remember that Human Flight started with the hot air balloon so you must be a little lenient and allow aviation to develop a hot air characteristic once in a while.

I have tried to submit a new line of thought as to why some of the bad conditions have come about and to take out some of the "mystery".

In closing let me state that flying, while not as safe as some of the older means of transportation, is much safer than many of you think it is—in fact, it is sufficiently safe for *you* gentlemen to use it as a means of transportation.

Dr. Bartlett—In order to properly estimate the importance of any impairment, whether it be physical, moral, or occupational, it is necessary to be able to clearly define and classify the impairment in question and to determine its value in terms of excess mortality. It is also important that we should be reasonably certain that the particular impairment will not shift to a group of greater or less hazard. The chief difficulty in underwriting aviation risks is that these requirements are not fully met. To be sure we are now able to classify the aviator fairly accurately but, after he is classified, we are still somewhat in the dark as to the extra mortality called for in each instance. Moreover there is a decided tendency for the status of the aviator to change. The transport pilot of today may be a stunt flier tomorrow. The airplane passenger may not take more than one or two flights a year at the time of application for insurance and may be flying to and from his summer home each week-end during the following summer.

Air risks may be divided into two main groups: passenger, and those connected with the Air Service in the capacity of pilots, mechanics, etc. Considering first the latter—it is the custom of most companies to refuse stunt and gypsy fliers, testers, sky writers and all fliers connected with the moving picture industry, and to accept with a surcharge, for a limited amount of insurance, pilots on regular air lines, air mail pilots, and fliers in the Army, Navy and Marine Corps, or in the Reserve. My Company will not accept persons who belong to glider or aviation clubs, and we also refuse all persons who own their own planes, even though a regular licensed pilot is employed.

The real problem before insurance companies at the present time is how to properly underwrite the applicant who takes an

occasional airplane flight as fare-paying passenger on regularly established air lines. If such individuals fly not oftener than three or four times a year it is our custom, and the custom of most Insurance Companies, to accept at standard rates. If they fly more frequently we make use of an aviation rider, which excludes liability if death occurs from an airplane accident. This rider cannot be used in all states, however. Unfortunately these rules are easier to describe than to apply, the main difficulty, of course, being that the applicant himself does not have a definite idea of his future activities in aviation.

As I have read articles on aviation written by actuaries and insurance writers I have been impressed by the fact that the actual mortality to pilot and passenger is uncertain, which, of course, makes it impossible to accurately estimate the extra risk assumed. Attempts have been made to compare aviation with railroad and automobile travel, but the results are more amusing than convincing. One fact, however, is certain. The more times a man flies the more times he is exposed to danger, for the hazard of flying is directly dependent upon the frequency with which flights are made and the length of these flights. In scheduled flying the passenger death rate last year was about one in each thousand flights or, assuming a flight to average 300 miles, one death to every 2,700,000 passenger miles. For several years the death rate of pilots engaged in scheduled flying has been one per million miles.

It is my belief that passengers traveling occasionally on regular airways may be accepted at standard rates; licensed pilots travelling regular routes should receive the most favorable rating; Army and Navy fliers are less favorable, while testers, instructors, and exhibition fliers are not insurable at any practical rate.

Theoretically the rate should be based on the number of air miles flown per year with due consideration given to the efficiency of the organization and the nature of the ground over which flights are made. The chief underwriting problem involved is to determine the actual intention of the applicant in

order to properly classify the risk and to exclude those who seek insurance to protect against an unusual immediate hazard.

Dr. Sykes has chosen the Human Element in Aviation as the subject for his excellent paper which has just been presented. Here again we have a factor which is difficult to estimate. There is, however, one form of human element which he has not considered, namely, the mental attitude of the Home Office official who acts on aviation risks. During the first week of October the National Convention of the American Legion met in Boston. For several days planes were constantly in the air flying alone and in formation and performing many complicated evolutions. Several times I counted 34 planes in the air at the same time. During all that time there was not a single accident.

Statistics show that the number of individuals carried by airplane has increased rapidly in recent years. Hoffman in a recent report states that three times as many passengers were carried in 1929 as in 1928. It is certain that the increase will be even more rapid in the years to come as the new generation grows up, for the boys and girls of today are decidedly air-minded. We must recognize this tendency and must adjust our mental attitude to the new situation and become more liberal in our treatment of aviation risks.

I agree with the opinion expressed by Dr. Sykes in a recent paper that we are too severe on applicants applying for insurance who travel by airplane over definite airways.

The big headlines and unusual publicity given in the newspapers to airplane accidents has an unfavorable effect on the human element in the Home Offices. We must not forget that airplane travel is becoming safer every year and that it is the duty of Insurance Companies to give protection to the air traveller as far as they may safely do so.

Dr. W. B. Smith—I think that Dr. Sykes has prepared a very interesting paper. He has pointed out one of the very important points necessary to take into consideration in underwriting lives of individuals who use the air as a means of

transportation. I would have only two further comments to offer. First, to those folks not versed in the aeronautical industry this work might tend to cast more or less of a pessimistic air over their ideas of the safety of transport flying. In the second place, this study has only begun and really deals with that particular phase of underwriting of the aviation hazard which gives us the least concern.

The longer I study the aeronautic industry, the more strongly I become convinced that the comparison of aerial transport with railway transport is erroneous. Never will aerial transportation simulate railway or automobile transportation for never will as many people be carried through the air as are carried by either of the two above mentioned systems. The flying industry on the other hand is more comparable to the marine industry and it is the comparison between these two means of travel that will give us the more accurate results. These two transportation methods are beset with the same difficulties in almost every instance.

I have been privileged within the past two months to have traveled over this great country and to have visited all four of its borders, and it is through this opportunity for study that I am fully convinced that our aerial transport companies have made great strides in the safety of passenger carrying and that we have little to fear as insurance companies insuring people who travel over these systems. Dr. Sykes' paper points out that much attention must be paid to the pilots of our transport companies. This is perfectly obvious. This is precisely what is being done today and has been the practice for some time. A study of the mortality record for our transport lines from October 1st of last year until the same date this year reveals practically a clean slate. There are several reasons for this, one of them being the work of one of our very prominent insurance companies in formulating a code similar to a fire underwriting code for the underwriting of aerial transport companies. This particular institution covers all lines, including public liability. After insuring these transport lines, it finds that it is

to its advantage to supervise them, which is being done and which shall have a far-reaching effect in bringing about a splendid mortality free flying record.

Our transport companies are not flying haphazardly. They are being supervised by regulatory law. There is much room for improvement, but there certainly is no doubt in my mind that the strides in efficiency and safety made by our aerial transport companies have been much greater than those made by any other transportation industry in the same length of time. Dr. Sykes has quoted that the aviation industry has been built on courage and sacrifice and over the bodies of dead pilots. It would seem, however, that this is only history repeating itself and that each one of our transportation industries has been built over the bodies of its dead pioneers.

In writing about the particular or detailed phase of the selection of pilots, Dr. Sykes has pointed out a particular case where apparently a military flier was found to be suffering from syphilis and that because of the error of a flight surgeon this man was allowed to fly. It would seem that the picking out of a single case is not quite fair any more than it would be to point out that this company or that company had just paid a large first year claim because of the failure of one of its examiners to detect a heart condition, for instance, that might have proved fatal. In fact, this probably has happened more than once in this great insurance industry. My close association with flying folks and flight surgeons would lead me to believe, however, that by and large our flight surgeons are conscientious individuals, alert at all times to picking out those physical discrepancies that might spell doom or failure if not detected. Furthermore, the individual states are taking up the question of state regulation which will be in cooperation with Federal regulation and it is my privilege to report to you that a great deal has been done already in this direction. It is with modesty that I mention my own State of Connecticut, but because of my intimate relationship with the State Department of Aeronautics I feel that I should say that flying is regulated and super-

vised with exceptional care. We make it a practice in that State to require Wasserman Reactions on every individual who desires to obtain a passenger carrying grade of license, and I can go on at some length to show in detail how carefully we supervise our flying folks twenty-four hours a day. There is no doubt that this same system will become more or less universal within a very short time.

The human element, however, is the big element in flying and unless very carefully supervised, as pointed out in Dr. Sykes' paper, we would get nowhere. In this paper, it is pointed out that we have been laboring under the delusion that ability increases directly with experience. I feel that I must take an exception in this instance in view of my own personal contact with flying folks over a period of about seven years. I have known a great many fliers and have watched them very carefully both on the ground and in the air. I honestly cannot see where there have been any delusions in this particular direction. Ability certainly increases directly with experience. It is not a question of how many hours a man flies, but it is a question of how much experience he has had in meeting adverse conditions and what he has done under the circumstances. In other words, when I select my pilot to fly me, I am not interested in the man who has flown five thousand hours without a forced landing, adverse fog conditions, or a crash, but I am interested in the man who has flown one thousand hours and who has spent a great deal of his time meeting adverse conditions and promptly solving its difficulties and who has crashed any number of times and has been able to walk away from the crash without having suffered the worse for it. This is the man with both ability and judgment, and this as a result of his experience. Frankly, there is no difference between the good flier and the good example in any other line of business, science or what not. Flying people are perfectly normal. They are subject to the same temperamental whims that any other folks are subject to. The only difference is that they have either inher-

ited or acquired an "air sense" in addition to their "ground sense".

Concerning the question of competition between air lines and the influence that this has upon pilots resulting in the taking of chances, might I say that I heartily agree with the author of this paper that this is a pernicious practice. It is a matter to be taken up by regulatory and supervisory agencies, but I often wonder whether this alone will remedy the matter. It is my belief that those agencies supervising pilots should more or less ignore the operating company's attitude and should put the matter squarely up to the pilot. If the pilot were accused of taking off in the face of adverse weather conditions, that pilot should have his license suspended for a period of three months. I dare say that this would probably settle for all times the perplexing situation in that company. It is to be remembered that the operating company and the pilot both receive remuneration for attempting to fly the air mail in the face of adverse conditions.

What then can this organization do about the whole matter of bringing about ideal supervision of flying personnel on transport lines? It is my opinion that they have a power possibly peculiar to such a body of men. We shall never get anywhere by writing and talking about it. I would suggest that the ideas that this organization might have should be in the form of law. It is not an easy matter to transform mere ideas into law, but it certainly would be a long step in the right direction if this organization would go on record in organizing a committee which would represent the entire life insurance industry and which committee should be invested with the power of taking up these matters with those gentlemen who have the power of writing into the law the ideas of this organization concerning the regulation and supervision of pilots on transportation lines.

It seems to me that Dr. Sykes has not carried his good work far enough, as I have mentioned before. It is not the transport companies that we worry about, but it is another great division of the flying industry that gives us real concern. It is

the insuring of those people who are actually engaged in aeronautics in other capacities than fare-paying passengers on regularly operated lines. This includes a large class of people, every one of whom more or less carries with him some increase in hazard. I have recently made a study of nine hundred thirty-one people that I have seen for the first time in my work in the selection of flying folks for both the Department of Commerce and the State of Connecticut, and while I cannot from the floor take the time to read to you these figures nevertheless there are some very interesting findings which certainly emphasize some of the peculiarities of the human element in flying. I am turning this table in to the Secretary and with it the privilege of publication. It might be of interest to you gentlemen. I regret, however, that my studies are only begun, for, in addition to the findings that I have with me, I am trying to find out how many of these nine hundred thirty-one people actually learn to fly and why those who do not learn to fly find it necessary to discontinue their activities. It is interesting to note the large number of males over females and it is interesting also to note the percentage of those rejected. One of the interesting things is the age decade in which the largest number of applicants were found to appear. This decade was between twenty and thirty years, there being five hundred forty-four of the nine hundred thirty-one cases appearing during this period. If one carefully studies the rest of the table, he will find the occupations listed and the number of applicants from each occupation.

At this point, it seems to be the place to discuss the question of training flying people. There are but two sources of training, namely, the military services and the commercial schools. The training obtained through the Army Air Corps or the Navy is of very high caliber. The pilots graduated from these schools are not only excellent flying men, but they are physically and mentally the cream of the American Nation. It is very difficult to obtain appointment to the Army School. In fact, last year there were about fourteen hundred applicants, of which only two

hundred could be taken. I am personally acquainted with the exacting physical and mental requirements for entrance to this School. Consequently then, the products that are turned out are the last word in flying people. When we consider the commercial training, we have a much different proposition. By and large, commercial training, as pointed out in Dr. Sykes' paper, is not as we would like to have it. And again, this is to be seriously considered in the underwriting of people engaged in aeronautics, but we have little to fear so far as picking our pilots to fly transport lines from this class of training, for we do not usually obtain them therefrom. The pilots who fly our best lines today are either army trained, which is usually the case, or they are pilots having been trained within the organization.

The school question has been long under fire so far as regulatory agencies are concerned. Flying is an expensive proposition and there will be a greater tendency toward fewer schools but much better ones. The finest commercial school in the country and an example of what all our schools will some day be is the Boeing School of Aeronautics on the West Coast. The transport pilots turned out from this institution have just as fine a training as those turned out by the Army and, in addition, more flying hours to their credit. Boeing transport pilots are excellent examples of what our future commercially trained pilots will be. We medical men can well remember when this country was full of third class medical schools, but this is not the case today, for every one of us knows that our medical schools are becoming fewer in number but better in quality. Therefore, I do not believe, so far as the human element is concerned with training, that we have much to fear.

Concluding my remarks, I feel that our companies might reasonably feel very optimistic about insuring fare-paying passengers over regular transport lines. The companies should underwrite with great care other people who are engaged in the aeronautic industry. In the second place, there should be no doubt in any one's mind that the human element is important in un-

derwriting the aeronautic hazard, but then, after all, isn't the humane element important in almost any kind of underwriting? Finally, I would make reference to a very important research work that was concluded last year by the Daniel F. Guggenheim Foundation. This work was carried on under the direction of Captain Dunn of the United States Army Air Corps. The most important point brought out in that voluminous piece of work was the fact that of all our companies writing life insurance in this United States only eight had attempted to underwrite the aeronautic hazard by bringing into their home office organization an individual or individuals thoroughly versed in the aeronautic industry. This is exceedingly important and when more companies will do this thing the sooner will the underwriting of aeronautics become as commonplace as the underwriting of individuals engaged in our using any other means of transportation.

A study of 931 applicants to the State Department of Aeronautics, State of Connecticut, for flying licenses. Some of these cases have been examined numerous times. Others have never been seen after the first examination.

Total number seen	931
Number of males	895
Number of females	36
Accepted	756
Rejected	105
Questionable	70
Age Factor	0 to 20, 159; 21 to 30, 544; 31 to 40, 191; 41 to 50, 33; 51 to 56, 4

The following table shows the relationship of occupation and the desire to fly. Because of the haste necessary to gather this material, the classification does not conform to any regular type. Further studies are being made at which time these classifications will be split up further into more detailed ones and made to conform with the regular code as used by life insurance com-

panies. Under aviation is included anyone who was connected in any way with the industry at the time he applied with the exception of airplane mechanics. The auto mechanic is also placed in a separate classification because of the frequency with which he is seen to apply for a flying license. Under farmers all those people who had to do with any horticultural pursuit have been included. Chauffeurs includes truck drivers or any individual who operates a motor vehicle for hire. It will be noted that twenty-seven occupations were unknown. This is because of the failure to learn at the time of the examination the occupation. Specialized individuals includes such occupations as chemists, electrical, mechanical and civil engineers.

Aviation	131	Occupations unknown	27
Skilled Laborers	128	Specialized individuals	19
Students	90	Professionals	15
Clerks	86	Unskilled Laborers	15
Salesmen	65	Builders and Contractors	12
Airplane mechanics	53	Officers of the Law	8
Auto mechanics	52	Teachers	7
Merchants	41	The Press	4
Farmers	38	Professional Entertainers	3
Not occupied	37	Members of Marine Industry Excluding Military Services	2
Chauffeurs	34		
Manufacturers	32		
Executives	31	Military Officers	1

Dr. Sykes—I asked Mr. Chambers whether the material that his company has sent out in connection with their Safety Campaign would be available to the members of our Association. He replied that he would be very glad to send it to anyone who desired it and if you will communicate with the United States Aviation Underwriters, at 80 John Street, New York City, this material will be forthcoming. It really would be worthwhile to write to him for this information, for this one booklet containing the replies of pilots with regard to the Safety Campaign is most interesting. I am very glad that he consented to furnish this information.

I want to take this occasion to thank Mr. Chambers and Dr. Bartlett for their excellent discussion.

SECOND DAY

DR. MUHLBERG—The mortality experience of policy-holders carrying large amounts of insurance has apparently shown wide fluctuations amongst the various Companies. Some of the Companies have had no reason to regret issuing insurance to them; other Companies have not been so fortunate.

It is for this reason that a paper by a Medical Director of a Company that has had a favorable experience should prove most valuable.

A STATISTICAL STUDY OF POLICY-HOLDERS WHO CARRY LARGE AMOUNTS OF INSURANCE

DOCTOR J. W. FISHER, MEDICAL DIRECTOR
Northwestern Mutual Life Insurance Company

Doctor Muhlberg, our worthy President, requested me, some months ago, to submit a statistical study on policy-holders who carry large amounts of insurance in the Northwestern Mutual Life Insurance Company; as he expressed it, the so-called "jumbo risks". He stated it was his impression that the Northwestern was one of the very few companies that had had a favorable mortality on this class of risks. He expressed a desire for a paper giving our actual experience, and to "particularly advise how we managed to secure favorable results".

I have little knowledge as to the actual results of but a few companies connected with our Association, as to their mortality on the jumbo class of risks. There has been very meager discussion in the past in the Association on this subject. Doctor Symonds at the January meeting in 1919 (page 217; Transactions of this Association; Meetings of 1917-1918) presented a very exhaustive and interesting paper on the experience of the Mutual Life, but the discussions brought out few definite results as to the experience of other companies, aside from that furnished by the New England Mutual and the Northwestern Mutual.

The Northwestern, up to 1927, has secured as favorable a mortality on this class of risks as on the general mortality of the Company covering about the same period.

Doctor Muhlberg in his letter to me stated, "I judge, of course, that it is almost entirely a matter of medical selection". In this I fully concur.

In complying with his request as to how we managed to secure as favorable a mortality on jumbo risks as that of the general mortality of the Company, it occurred to me that the

best method would be to describe just how risk selection is conducted by the Northwestern. By so doing, each member will be enabled to form his own conclusions. The attitude of the management of the Northwestern toward the Medical Department is fairly set forth in a discussion of Doctor Eakins' paper on the functions of the "Medical Director"; page 142; Volume Ten; 1923-1924 Meetings; Transactions of this Association.

All applications are sent direct to the Medical Department on receipt at the Home Office. Each application is checked with the appointed medical examiners' index; then with the M. I. B. index. If previously insured or rejected by this Company, the previous application is attached to the new application, with a work sheet, on which is recorded all data, including the numbers, amount and kind of all policies previously issued by the Company. The amount of policy loans, lapses and surrenders, if any, also are recorded on the work sheet. The amount of insurance carried in other companies is shown in the new application. An Inspection report is secured in all cases, and in amounts of $50,000 or more a special report, with a current Dunn or Bradstreet is required. Comparisons are made by lay reviewers, who refer material discrepancies between the old and new application, and any impairments, to a member of the medical staff.

Medical reviewers dispose of all amounts of $5,000 or less (except to decline), free from medical impairment and with a satisfactory inspection report; two signatures required. Amounts over $5,000 and up to $10,000 may be approved or rejected by one lay reviewer and a member of the medical staff. All amounts more than $10,000 require the approval or rejection of two members of the staff. Conferences are held on all doubtful or questionable cases with the Medical Director or other member of the staff.

For the past thirty years, the Medical Department of the Northwestern has been held responsible for the mortality of the Company. No committee or officer, outside of the Medical Department, is allowed to overrule the decision of the Medical Department on questions of a purely medical nature in risk selection.

Soliciting agents are permitted to request the Medical Director to resubmit applications to the Insurance and Agency Committee, where the rejection was based on reasons other than medical. Such requests are rarely made.

For about the same period of time, the Company has not accepted brokerage or reinsurance business, nor has it accepted business from certain unhealthful localities. The nearest approach to brokerage is so called surplus business. This is accepted by the Company only when placed through an agent of the Northwestern by the agent of another company, which has the full limit issued by that company. The anti-rebate rule has been enforced for a long term of years.

The percentage of rejections on the general business of the Company averages slightly less than 4% of all authorized completed applications recommended by the local medical examiners. The percentage of rejections by the local examiners averages about 1½%.

Double examinations by the local examiners are required where the amount applied for exceeds $30,000. The percentage of rejections in double examinations is a fraction less than 1½%. The percentage of rejections by the Medical Department of applicants applying for $100,000 or more is a fraction less than 3% of all completed examinations recommended by the local examiner.

In the year 1885, when the present Medical Director entered the service of the Company as Assistant Medical Director, the limit of insurance issued on one life was $30,000. The following year the limit was raised to $50,000; in 1898 to $100,000; in 1918 to $150,000; in 1924 to $200,000 and in 1928 to $250,000.

Following is the mortality experience on lives approved for $100,000 or more, as indicated. Exposure dates from first appearance for a total of $100,000 and covers the time that any old or new insurance is in force thereafter. If all insurance was terminated and the life came in again, it counts from the same date as before, and the interval during which there was no risk is omitted.

MORTALITY EXPERIENCE ON LIVES APPROVED FOR $100,000 OR MORE

	No. of Lives	Average Age	Average Duration	No. of Deaths	Mortality A.M.Table
From date of approval to policy anniversary in 1916	1305	43	6.7yrs	75	75.8
From date of approval to policy anniversary in 1919	1305	43	9.4 "	123	83.3
From date of approval to policy anniversary in 1923	3169	42.6	6.9 "	214	78.4
From date of approval to policy anniversary in 1927	4978	42.4	7.3 "	363	78.3
Number of Lives (out of 4,978) previously insured	3665	—	—	280	76.7
Number of Lives (out of 4,978) not previously insured	1313	—	—	83	84.5
Number of Lives (out of 4,978) approved for $200,000	603	—	2.1 "	4	52.6

EXPERIENCE BY AGE AT APPROVAL

Age at Approval	FIRST 5 YEARS Act.	Exp.	Ratio	AFTER 5 YEARS Act.	Exp.	Ratio	ALL DURATIONS Act.	Exp.	Ratio	No. of Lives
20–29	1	3.5	28.6%	5	4.0	125.5%	6	7.5	80.0%	260
30–39	29	25.6	113.3	32	44.0	72.7	61	69.6	87.6	1,516
40–49	44	64.2	68.5	129	146.7	87.9	173	210.9	82.0	2,191
50–59	38	53.0	71.7	85	122.6	69.3	123	175.6	70.0	1,011
All Ages	112	146.3	76.6%	251	317.3	79.1%	363	463.6	78.3%	

Average Age at Approval—42.4
Average Duration— 7.3

EXPERIENCE BY YEAR OF APPROVAL

Year of Approval										
1898–1917	59	61.7	95.6%	232	286.3	81.0%	291	348.0	83.6%	1,624
1918–1923	45	67.2	67.0%	19	31.0	61.3%	64	98.2	65.2	1,947
1924–1926	8	17.4	46.0%				8	17.4	46.0	1,407
All Years	112	146.3	76.6%	251	317.3	79.1%	363	463.6	78.3%	4,978

CAUSES OF DEATH

Cancer	39	Broncho-Pneumonia	5
Nephritis	18	Pneumonia Lobar	28
Cerebral Apoplexy	26	Suicide	21
Organic Heart Disease	29	Casualties	36
Angina Pectoris	27	Ulcer of Stomach	4
Arteriosclerosis	15	Influenza	5
Disease of Arteries, Atheroma, etc.	19	Diabetes	6
Sudden Death	6	Appendicitis	9
Disease of Bladder, Urethra and Prostate	7	Miscellaneous	63
		Total	363

GENERAL EXPERIENCE 1906-1915—EXPOSED TO 1920

No. of Policies	No. of Deaths	Mortality
429,554	15,858	78.75%

Each case is considered on its merits; both large and small amounts. Strict attention is given to habits in the use of stimulants, build, medical impairments, occupation, morals, environment, and especially, in cases applying for large amounts and where heavily insured in other companies, the question of over-insurance is carefully investigated through Dunn, Bradstreet, inspection agencies, the solicitor, general agent and local examiner, and through other companies, if recently applied to. The element of self-selection is always borne in mind in risk selection, not alone in large insurers but in all amounts. The Company does not do a sub-standard business. All approved cases are insured at standard rates.

The Medical Department, for over thirty years, has adhered to the rule to keep a record of all doubtful classes of cases, and from time to time to determine the mortality as a check on the desirability of the risks as a class. To illustrate: We had determined the mortality on a large per cent. of the data contributed to the M. A. Committee on Medical Impairments, Occupations, Consumptive Family Records, Rheumatism, Hemoptysis, etc. Probably 50% of the data furnished the Committee had been previously investigated by the Actuary and the Medical departments, which was the nucleus of the Specialized Investigation, which event led to the M. I. B. Investigation. It was also along these lines that the Medical Department of the Northwestern demonstrated the value of the sphygmomanometer in risk selection.

In risk selection, especially the jumbo class, we insist on sufficient time to satisfy ourselves that we have all the material facts possible to be obtained, in each case, bearing in mind that the incentive to self-selection in large insurers is more prevalent than when small amounts are involved. A specimen of urine, for examination at the home office laboratory, is required in each case where the amount applied for is $25,000 or over.

Much valuable information may be obtained by a careful study of death claims, especially those occurring in the first few years, both by the medical staff and the local examiner. We notify the latter of the death and cause in each case he has examined, when death occurs within five years, especially in cases where there is evidence that possibly we were not furnished with the full facts, either by the applicant or the examiner, at the time of our approval of the case.

In my humble opinion, better results can be secured in risk selection, in a mutual life insurance company, by holding the Medical Department responsible for a satisfactory mortality than by mixed lay and medical committee action, provided the medical staff are willing to take the responsibility and are willing, also, to fit themselves to intelligently handle this phase of the business by securing reliable facts, as shown by the actual experience of their company and that of other companies. The Medical Department of the Northwestern has been practically unhampered by lay committee action, and a very important factor has been a satisfactory cooperation on the part of the agency force of the Company and its corps of local medical examiners.

Dr. Snow—About a year ago, before we knew of the presentation of Dr. Fisher's paper, we discussed the possibility of an investigation which would have been strictly in accord with the title of this discussion. The practical difficulties seemed insurmountable at the time, and we were forced to content ourselves with investigating our experience by policy amounts.

The data we have is comparable with that submitted by Dr. Fisher except that the period covered by our experience differs. It also differs in that his experience is traced from the date of issue of the contracts up to certain policy anniversaries, whereas under our experience is on the period from 1919 to 1928, it was investigated irrespective of the date of issue of the contracts.

In anticipation of the smile which will follow one item of this report may I say that when our Actuarial Department completed this investigation and gave me the figures I didn't smile: I laughed out loud. Of course, we found the answer, simply accidental due to limited number, but mainly because limit coverage and coverage approximating that was generally represented by a number of policies, since in the period under observation our limit was gradually increased from $100,000 to $300,000. The excess mortality, therefore, appears in the $10,000 to $25,000 and $25,000 to $50,000 groups.

The greatly abbreviated summary of our experience is as follows:

MASSACHUSETTS MUTUAL MORTALITY EXPERIENCE—AMOUNTS

Issues of 1907 to 1927 Inclusive Exposed from the Policy Anniversaries in 1919 to the Policy Anniversaries in 1928.

Expected Deaths computed by the American Men Select Mortality Table

General		$0 to $10,000		$10,001 to $25,000	
Actual Deaths	Expected Deaths	Actual Deaths	Expected Deaths	Actual Deaths	Expected Deaths
All Ages					
48,007,600	66,039,486	32,842,200	46,622,361	9,322,300	11,436,383
72.70%*		70.44%*		81.51%*	

$25,001 to $50,000		$50,001 to $99,999		$100,000 and Over	
Actual Deaths	Expected Deaths	Actual Deaths	Expected Deaths	Actual Deaths	Expected Deaths
4,352,200	5,469,912	788,000	1,140,349	700,000	1,399,753
79.57%*		69.10%*		50.01%*	

*Ratio of Actual to Expected Deaths.

For all policies over $1,000 the actual deaths were $15,162,500, which amount is 77.97% of the expected deaths of $19,446,397.

On account of random fluctuation the complete analysis by age groups is not particularly significant except the tendency in the age 50 to 54 and 55 to 59 groups where the experience on policies of $25,000 to $100,000 is approximately ten points higher than the average experience at those ages. In the consideration of these figures it should be remembered that most policies of large amounts are of necessity issued at the higher ages where the mortality is, even normally, slightly higher than the Company's average. There seems to be no great practical objection to this since nearly 90% of the business written by the average company is on policies of $10,000 and under, and

the Company can, therefore, stand the slightly higher mortality on policies of larger amount without greatly affecting the aggregate average.

The group showing the most unfavorable mortality is that representing policies issued for amounts between $10,000 and $25,000 where the experience represented 81.51% of the American Men select mortality. As a reason for the high mortality of this group it is possible that some tendency to limit the amount of insurance where there is some question about acceptability may have contributed to the high mortality of this group.

In considering any such experience it would seem that the results obtained from the records of one company alone might be seriously misleading as a picture of the mortality on policies of large amounts. The real basis for such computation should, it seems to me, be the total insurance held by particular individuals in not one company alone, but in all companies. In other words, the mortality is certainly more a function of the total amount of insurance carried by the companies individually and collectively than the amount carried on any particular policy, and if the data were so arranged I believe that both our own figures and the Northwestern figures would produce very different results.

Naturally we are all greatly interested in that part of Dr. Fisher's paper which refers to the conduct of risk selection by his company. I find no material variation from our own method, though, of course, there is considerable variation in our dealings with certain under-average classes.

Our mortality figure of 72.70%, quoted above, is not strictly comparable with Dr. Fisher's figures, but from the annual reports of the two companies for the years 1920-1929, inclusive, based on the American Experience Table, the Northwestern's figure is 50.792%, ours 50.407%.

On the matter of declinations, Dr. Fisher's figures are based on Home Office rejections on applicants recommended by local examiners with the total a little under 5½%. Our own figure for the past ten years is slightly under 5¼%.

DR. SCADDING—Mr. President and Gentlemen—Mr. President, I congratulate you upon the possession of a charm which enabled you to lure the "Lion of Milwaukee" from his "lair".

To me Dr. Fisher has always been the embodiment of all the faculties that go towards the creation of a sound adviser to a Life Insurance Company, an indomitable worker whose interest in the business as a whole and in his excellent Company in particular has never flagged for a moment during his long and honorable career; autocratic, if you will, but in the best sense of the word; kind and helpful to others, lay and professional, engaged in similar work to his; seriously minded to a degree; painstaking and accurate to a fault; and unmovable in opinion once definitely reached.

Knowing Dr. Fisher, as most of us old fellows do, it is impossible to escape the conviction that the Management and Directors of his Company thirty years ago knew their man then as well as, or better than, we do now—knew that they possessed a man of unusually strong character and ability. Was it any wonder that they threw the responsibility of the Company's mortality upon his shoulders? They gave free rein to his governing ability, knowing full well, I am sure, that his business acumen, fine balance, and sense of justice would prevent an assumption of that "absolute power that corrupts absolutely".

Dr. Fisher said some years ago, in speaking of how a desired mortality might be secured to the best interests of a Company as a whole, that the most important factor was the Medical Advisor's acquisition of the confidence of the Management, and having the confidence of the Management was a great aid in securing the confidence of the Agency Management and the field worker. I have no doubt he is here speaking from experience. He evidently early secured the confidence of the field forces, a feat that cannot be accomplished till the agent's old and sometimes fixed idea that the Medical Department is his natural enemy has been dispelled.

Dr. Fisher quotes from the President's letter to him, "I judge, of course, that it (the Northwestern Mutual's favourable mortality in the risks under consideration) is almost entirely a matter of medical selection," and adds quite frankly, "In this I fully concur". He proceeds to tell us what his Company does and what it avoids and then sets forth the extremely satisfactory result of his Department's selection of "Jumbo Cases".

Mr. President, you used the word "almost" qualifying the expression "entirely a matter of medical selection" and Dr. Fisher fully concurred. Is it not fair to conclude that "almost" has reference to another factor, to my mind a very important one, namely the initial selection by the Company's solicitors?

Dr. Fisher is a past-master in the art of "conducting risk selection in such a manner that there will be a minimum of friction with the agency force of the Company". Could he be such a master if his training and influence had not reached every important agent of his Company, as well as every medical and lay associate at Head Office? I am sure you will all agree that the revelation of this particular experience is another occasion when we must make obeisance to this Potentate.

The Canada Life's Committee on Selection has actuarial and business representatives as well as medical, and would appear to be a vastly different piece of machinery from that in use at the Northwestern Mutual, but in truth, when one considers Dr. Fisher's many-sidedness, are we so very far apart? I imagine there have been very few "Jumbo Cases" in his Company that do not bear his initials. That he has most capable assistants, all will agree, but there again, I venture to suggest, is the evidence of his pre-eminence as a selector and educator. Fortunate indeed is he in having such support, and fortunate they to have his multi-colored mantel descend upon them from the inception of their incumbencies.

The mortality of the Northwestern Mutual on amounts of insurance over $100,000 must be considered as most satisfactory, and I doubt if there are many, even any, other companies who

have experienced as low a mortality percentage on their large policies.

Though the experience of my own Company on large amounts is small (we having had only nineteen deaths for amounts of $50,000 and over, for years of issue 1919 to 1928, exposed to 30th of June, 1930) the ratio of the actual to the expected mortality far exceeds the Northwestern Mutual ratio, is, indeed 108% on the basis of the A. M. Select. In Dr. Fisher's exhibit, the Mortality Table is mentioned as the A. M. Table, and I am not sure whether he has used the Select or the Ultimate Table. I judge that it is the Select Table. If it is the Ultimate Table then, in comparison, I would say that our percentage would be slightly over 90%. Deaths from accident amounted to three out of the total of nineteen, while diseases of the heart and arteries have accounted for six deaths. The suicide death rate in our experience has been high, there being four deaths out of the nineteen from this cause. One large claim in the group, I have reason to believe, would have been avoided had we obtained a Bradstreet's Report in addition to the usual special inspection that was secured; and if one four hundred thousand dollar bull elephant, very soon after we had made his acquaintance, had not walked into our little china shop and there dropped dead with a bullet in his brain, the death strain would not have been so formidable.

Of interest among Dr. Fisher's records are the facts that on policies for large amounts, where there was no previous insurance, the mortality was 6.2% higher than for the total of all large policies; and 7.8 per cent. higher for cases where the aggregate amount of insurance had been built up to $100,000 and over; and in cases for $200,000 the mortality is exceptionally low. These policies, however, have been on the books for only an average duration of 2.1 years, but if the A. M. Table used is the Select one, this must be considered very favorable mortality for this class.

It is noteworthy that the mortality in the age group 50 to 59 is much lower than in any other age group. In the case of

our own Company the mortality was much better at the older ages.

The conservative spirit should be enthroned in the Department of Selection, and light and sound should enter freely. Unfortunately, under these conditions, "siren voices" will ever resound through its halls. Dr. Fisher seems early to have learned the trick of turning a deaf ear to such pretty songs as "More fine risks depending on this one, Doctor", "Outstanding citizen and inside pillar of the Church", "Has policies in all the best companies", "Resides in a dry country and only divorced twice", "I need this to make the big club".

CANADA LIFE MORTALITY EXPERIENCE

Amounts of $50,000 and over issued at one time during years 1919-1928. All deaths up to 30th June, 1930, included.

By Ages	*Actual Deaths*	*Expected Deaths by American Men Select Table*	*Ratio of Actual to Expected Deaths*
Up to 29	50,000	41,324	121%
30-44 Incl	800,000	416,899	191.9%
45 and over	1,671,000	1,856,379	90%
All Ages	2,521,000	2,314,602	108.9%
By Durations			
1st 5 Years	2,214,000	1,648,658	134.3%
6th Yr. & After	307,000	665,944	46.1%
All Durations	2,521,000	2,314,602	108.9%

LARGE AMOUNTS INVESTIGATION (1919-1928) AS AT JUNE 30, 1930

ANALYSIS OF DEATH CLAIMS

Cause of Death	*No. of Lives*	*Amount*
Diseases of Heart	5	$ 482,000
Suicide	4	825,000
Accident	3	345,000
Pneumonia, Influenza	3	168,000
Brain Tumor	1	50,000
Addison's Disease	1	50,000
Uraemia	1	541,000
Cancer	1	60,000
	19	$2,521,000

I trust that successors in my office will at a future date be able to present to this Society a more pleasing picture of this class of cases than I have been able to, the while not having impaired the esteem and loyalty and cooperation of the field forces which have been built up to an uncommonly high level by a succession of wise and honorable and devoted Presidents and General Managers.

DR. WEISSE—Gentlemen, Dr. Fisher's paper with reference to the experience of the Northwestern Mutual Life Insurance Company in cases of $100,000 and over, from 1898 to 1927, is of great interest and I wish to congratulate him on the extremely satisfactory results which he has obtained over a period of thirty years.

The selection in the Mutual Life Insurance Company of New York is in charge of a Second Vice-President, who is the Manager of Selection for the Company. Under his direction the Medical Department and the Department of Supervisor of Risks—which acts on all questions of finance, habits, moral hazard and habitat—function. A Medical Officer and the Supervisor of Risks, or one of his assistants, pass upon all large cases and special cases are further acted upon by an Applications Committee, consisting of a Medical Officer, an Officer of the Supervisor of Risks Department, an Actuary and a representative of the Agency Department—medical approval being required. Cases of $150,000 and over must be further approved by two executives.

The number of factors which have to be considered in the selection of a large risk increases in direct proportion to the increase in the amount of insurance applied for, whether to one Company only or a so-called "Jumbo" aggregate of policies in a number of Companies. Nor do these factors always appear on the surface; they are sometimes discovered only after careful study of all the facts that it is possible to collect with reference to the risk in question. To my mind the most difficult group in this class of cases is composed of the individuals who

have made an enormous amount of money in a comparatively short time, more particularly where there are no backgrounds to give us any clue as to the probable reaction of the individual.

The next most difficult group is made up of individuals who are more or less the economic rulers of small communities, as it is extremely difficult in these cases for either the examiner or the inspector to obtain adverse information, individuals being afraid to give it.

A third group are those which have a long questionable record—not in itself sufficient to bar the possibility of acceptance, but requiring a great deal of study and investigation.

We feel as a result of our experience in the selection of large risks that there is hardly a detail of importance, from any standpoint, in the past history of the individual, which may not be worthy of careful investigation by either an especially trained medical man or lay inspector.

We depend greatly on our Referee system, with which most of you are more or less familiar, and the examinations of at least 80% of our larger risks are made by men who have been trained at the Home Office. In addition to these we accept examinations by a comparatively small number of men outside of our own examining forces and these men are selected with great care—the majority of these being medical officers of other Companies.

Our group of medical men whose examinations are accepted for large amounts, are carefully trained in our methods of going into extended detail on all questions of medical history and freely demand statements from attending physicians or institutions which are furnished without expense to the Company. We always endeavor to obtain an appointment for examination which will insure sufficient time and privacy for a complete history and thorough examination with the applicant properly undressed.

Any thoroughly competent medical man can give us a satisfactory physical examination of a risk and take down a routine history, but it takes the specially trained man to size-up the whole picture as presented and get a completely detailed medical his-

tory from the individual and fit that and the medical examination together for our benefit. One might say that the experienced medical examiner develops what is almost an additional "sense" in the line that his questioning and investigation often takes where the ordinary competent examiner would send in a perfectly clean report.

Our inspectors in the field who investigate these larger risks are also carefully trained at the Home Office before they are sent into the field and in consequence we feel that when we get the information from the medical man and the inspector, who have both been trained at the Home Office in our methods and are thoroughly competent, we have as nearly a complete collection of the factors which enter into the selection of a risk as it is practically possible to obtain.

Our inspectors frequently bring out the information, definitely medical in character, which has been actually forgotten or otherwise omitted by the applicant in his interview with the examiner. Any clues as to possible medical history which are brought out by the inspector are followed up from the medical standpoint and full details with reference to it must be furnished us from a reliable medical source before any action is taken.

We feel that the selection of the large risk, or any risk, is very definitely aided when we are satisfied that we are as thoroughly conversant with the facts bearing on the case from the medical, financial and moral standpoint as it is possible to be. We can then approach the question of selection with confidence in the information upon which such selection must be based.

The experience which we have to submit is based not on individual lives but on amounts of $50,000 and over, from 1907 to 1927, exposed to 1928, issued on one application—practically the same as if it were upon lives—from ages 15 to 70, inclusive, men and women combined. The area from which these cases are drawn is the entire United States, with the exception of Texas and Canada, with some few applications from American citizens living in foreign countries. From March, 1907, to April, 1927, the maximum amount of insurance which we carried on

one life was $250,000; from April 27th, 1927, to May 29th, 1929, $350,000, and from May 29th, 1929, to date, $500,000.

Our experience is divided into two groups of cases—one the issues of 1907 to 1918 and the other the issues of 1919 to 1927, both exposed to 1928. The entrants for each period, the average age at issue and the average duration is as follows:

Issue Period	Entrants *No.*	Entrants *Amount*	*Average Age at Issue*	*Average Duration*
1907-1918	1,919	$144,016,500	43.3	9.2
1919-1927	6,579	563,455,800	42.9	3.9
1907-1927	8,498	707,472,300	42.8	5.1

EXTENT OF DATA—ISSUES OF 1919 TO 1927

Amount of Insurance On Application	Entrants *No.*	Entrants *Amount*	Dead *No.*	Dead *Amount*
$ 50,000 to $100,000	5,647	$371,607,900	145	$ 9,745,400
101,000 to 250,000	775	129,107,200	18	2,820,300
Over 250,000	157	62,740,700	1	300,000
Total	6,579	$563,455,800	164	$12,865,700

I am sorry that I am unable to give the distribution of the 229 deaths among the 1907-1918 entrants in the same way.

MORTALITY RATIOS—LARGE AMOUNTS FOR $50,000 AND OVER ON ONE APPLICATION BASED ON THE A.M. SELECT TABLE

ISSUES OF 1907 TO 1927—EXPOSED TO 1928 ANNIVERSARY—MEN AND WOMEN COMBINED

Ages at Entry	POLICY YEARS																	
	One to Five						One to Ten						All Policy Years					
	1907 to 1918		1919 to 1927		1907 to 1927		1907 to 1918		1919 to 1927		1907 to 1927		1907 to 1918		1919 to 1927		1907 to 1927	
	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.
Under 30	427	417	87	113	178	188	269	265	69	93	137	148	240	224	69	93	126	142
30-39	150	165	87	84	106	100	145	102	80	74	108	107	146	159	80	74	113	113
40-49	94	93	88	83	89	86	83	80	88	86	86	84	92	93	88	86	90	90
50-59	63	74	65	64	64	66	82	81	60	60	69	68	81	79	60	60	71	69
60 & Over	54	53	40	37	43	41	78	76	48	41	58	53	75	68	48	41	59	53
Total	98	103	72	71	80	79	96	95	71	70	81	79	97	96	71	70	84	82
Company's General Experience	90	90	66	70	76	77	83	84	66	70	75	77	82	85	66	70	76	78

Causes of Death		
Casualties	37—	22.6%
Cardio-renal-vascular	31—	18.9%
Pneumonias	20—	12.2%
Cancer	17—	10.4%
Suicide	15—	9.1%
Influenza	5—	3.0%
Appendicitis	4—	2.4%
Diabetes	2—	1.2%
Miscellaneous	33—	20.2%
	164—	100.0%

It is very difficult to make any real comparison between the two experiences presented as the data upon which they are based vary materially—duration, ages, amounts, territories from which business is derived, etc—so I will not attempt to do so.

In closing I wish to thank Doctor Fisher for giving us the benefit of his ripe experience and hope he may eventually carry his material to the fortieth year mark, for our benefit.

Dr. Huston—This discussion of jumbo risks has been a very important and practical part of this meeting. I want to say just a word relative to the handling of such cases in the way of surplus lines as submitted to other companies by a producing company. Larger companies here in New York of course usually have the first chance at the larger jumbo cases and then the surplus amounts are distributed to companies throughout the country, usually by way of photostats. It has been our practice to consider business upon the basis of photostats provided we have a letter from the Medical Director of the producing company saying that they have accepted their limit of insurance at standard rates upon those identical papers. I think this is a most important thing in asking for insurance on surplus lives. It is entirely proper that the producing company submit the photostats with such a statement from its Medical Director tc the Medical Director of the company to whom they are being submitted, for two reasons—first, it gives us more confidence in the photostats, and second in those cases subject to rating it has been our practice—and I think it is the practice

of all companies—not to issue at a rate less than the producing company has issued. That would be embarrassing to both the producing company and the accepting company. I think it is most important that in asking for surplus business, whether on photostats or not, a statement accompany the papers from the medical department of the producing company as to what they did on that case so that those being asked to take surplus amounts will handle it in a similar manner.

Dr. Fisher—I don't know as I have any comments to make. We had 4,978 cases and all these were taken on their merits. For reinsurance we do take surplus business and we have had as favorable a mortality on that as we have on our general average. Now the way we carried on this mortality was by making out a card in the Medical Department every time we took a risk that brought him up to the limit or up to $50,000. These cards are furnished to the actuaries' department from time to time when we want to make a round up, and that is what we have done with our surplus business or any class of business that we want to keep tab on, just as we did when we first went into the business. Our company would not accept an examination made by the family physician of the applicant. I inquired why. Well that applicant and doctor were a thousand miles away from here and that gentleman had more interest in his patient than he had in the company. I told them I believed the medical profession was quite up in honesty with any other profession or class of people so we finally decided to accept information from them regarding their patients as from a regularly appointed examiner. From time to time I would look into the matter and see how we were getting along. And here three years ago the actuaries took our mortality on these cases from the cards we were keeping and found that we were 12 points better than our general average business and that is the way we checked up the blood pressure, by keeping tab on those cases that we had any doubt about and from time

to time check them up. I wonder if there is any thing in this theory of mine that the larger the policy the greater the suicide element and the casualty. Now in this data of mine we have casualties that are practically 10% while the general average of the company from the organization is only 7.35 and with the class of risks averaging at entry 43 years you wouldn't expect the casualty element to enter into it. I don't know if you have all read the paper but I have called attention to the first five years of 76.6, after five years 79.1, all years 78.3.

I don't know, Mr. President, that there is anything further that I can say.

DR. SCADDING—May I ask Dr. Fisher a question or two? I want to find out from Dr. Fisher as to the limit of risks, whether the limits of risk were the same in all ages or were there any graduated limits of risk in younger and older ages. For instance, 20 to 25. Are the limits of your risks the same as they are from say 25 to 50?

DR. FISHER—At the younger ages the limit is smaller.

DR. SCADDING—Much smaller?

DR. FISHER—Yes.

DR. SCADDING—To what do you attribute the favorable mortality in the young cases applying for large amounts.

DR. FISHER—Good selection.

DR. MUHLBERG—The next paper on the program is one by Mr. Koeppe and myself on southern mortality and this gives me the opportunity to perform a very pleasant task. Is Dr. Rowley here this morning? Dr. Rowley, will you kindly step up to the chair and assume the burden of the office while Mr. Koeppe and myself present our paper? Dr. Rowley, I want in the first place to felicitate you upon the honor conferred which you so richly deserve and I want particularly to congratulate the society on the

wisdom of its choice. I hope your administration is going to be a happy and very successful one.

DR. ROWLEY—Thank you.

The honor that you have given me in electing me President of the Association for the coming year is one that I very deeply appreciate. In your action I am conscious of the fact that you have at the same time expressed a well earned tribute to the company that I have been fortunate to be connected with. For many years past the officers of my company, I think you will all admit, have been identified in a prominent and forceful manner with the various steps of progress that have been made for the betterment of life insurance as a whole. In this connection I have in mind particularly the work that has been done by the President of my company, Mr. Welch, during his long term of service as a member of the Actuarial Society, and at one time President of that body, and in connection with the work of the several joint committees for M/a investigation. I want also to speak of the prominent part that my little company—if I may refer to it that way—has had in the betterment of the sales conditions of life insurance and with that work I am sure there will always be linked the name of our Vice-President, Winslow Russell.

When I review the names of the distinguished predecessors in this office, I feel both proud and humble and my hope is that the affairs of this Association during the coming year may be carried on in a manner that will justify the trust and the confidence you have placed in me. In assuming these great responsibilities, I know that I can depend upon the members of this Association for assistance when called upon. I thank you.

It will be our pleasure now to listen to the paper to be presented by Mr. Koeppe and Dr. Muhlberg on the Mortality of the Union Central in the Southern States.

MORTALITY IN SOUTHERN STATES

By Arthur J. Koeppe and Dr. Wm. Muhlberg.

The Union Central Life Insurance Company for many years has been writing a considerable portion of its business in the Southern States of this country. A strong impression existed for some time among the Officers of the Company that the mortality experienced in the South was less favorable than that in the other sections of the United States. It was our good fortune to be charged with the duty of studying the Southern mortality and to "substitute facts for appearances and demonstrations for impressions". Accordingly, a medico-actuarial investigation was undertaken with the assistance and under the guidance of Mr. E. E. Hardcastle, our Actuary. The first investigation into the mortality experienced in the South was made during 1927, covering the issues from 1916 to 1925. The investigation was made by calendar years as it seemed desirable to compare the mortality ratios obtained with the corresponding ratios for the whole Company. The latter could without undue labor and expense be determined only by calendar years. The results proved to be so interesting that in 1929 it was decided to add the years of exposure 1926, 1927 and 1928 without, however, including the issues of these years. In the following remarks we will discuss the results of the second investigation and refer to the first one only for the purpose of pointing out the changes in the mortality ratios that were primarily due to the inclusion of these additional years of exposure.

The data were divided into Select business, covering the first five years of exposure, and Ultimate business, covering the subsequent years of exposure. The following States were selected (hereinafter referred to as "Total South"):

Alabama
Arkansas
Florida

Georgia
Louisiana
Mississippi
North Carolina
Oklahoma
South Carolina
Texas.

The individual states were divided by grouping together the counties of each state that in the Medico-Actuarial Mortality Investigation were considered Delta Counties, Gulf Counties, Coast Counties, and all other Counties, which, for convenience, were called "Inland" counties. The names of the counties coming under these various headings are tabulated on a card designated "Habitat" and published for the M. A. investigation. An attempt was made to distinguish between urban and rural sections by separating and combining those counties in which the amount of insurance in force was $200,000 or more at the time the investigation was begun. These counties contained at least one large town each and were therefore considered to be urban; all other counties were assumed to be rural.

The investigation was made by amounts of insurance in four age at issue groups, namely, 15-34, 35-49, 50 and over, and all ages combined.

The American Experience and also the American Men tables were used to determine the expected mortality.

As a measuring rod we used the following actual to expected mortality ratios for the whole company, exclusive of the business included in the Southern Investigation.

TABLE NO. 1

	AMERICAN EXPERIENCE		AMERICAN MEN	
AGES AT ISSUE	Select	Ultimate	Select	Ultimate
15–34	26.04	29.79	54.19	56.35
35–49	36.08	38.76	63.90	58.96
5o and over	48.79	72.36	62.38	75.70
All ages	38.45	56.02	61.65	69.51

For ready comparison the American Experience ratios for each sub-division were divided by the corresponding American

Experience ratio found in the above table, and the results entered in the last column of the tables III and IV at the end of this paper.

In order to judge the reliability of the mortality ratios calculated for the various sub-divisions another column was added to some of the tables giving the percentage the exposure in each group bears to the total Select or Ultimate exposure respectively for the whole Company (Southern States included).

Table I gives the combined figures for

1. The Whole Company.
2. Ten selected Southern States.
3. The Whole Company, exclusive of the ten Southern States,

showing the exposures to the nearest $1,000, the expected losses, the actual losses and the ratios. It must be remembered that Texas is included in the Southern States. Texas as a whole had a favorable mortality, and contributed 32% of the Select and 30.5% of the Ultimate exposure in the South.

In Table II the same data as those shown in Table I are tabulated for each of the ten states individually.

In Tables III A, III B, III C and III D, the Select Mortality ratios are given for the Gulf, Delta, Coast and Inland Counties separated in urban and rural districts, and tables IV A, IV B, IV C and IV D, deal with the ultimate mortality ratios for the same sub-divisions. The mortality experience for the rural districts, both Select and Ultimate, is materially higher than that for the urban districts for all ages combined. However, the ultimate mortality for the youngest and oldest age groups shows the reverse, which is probably due to *paucity of data.* The figures for the Delta and Coast counties are of little value as only a very small portion of the Company's business was written in those districts. Nevertheless the tendency of the rural mortality to be less favorable than the urban mortality is here also quite apparent.

The Select Mortality in the South is 27% higher than the mortality for the Whole Company (exclusive of the South) and the ultimate mortality is 17% in excess.

In the first Southern Mortality Investigation undertaken by this Company, which included only years of exposure 1921 to 1925, a different result was noted. The ratios obtained by dividing the ratios of actual to expected (American Experience) for the South by the corresponding ratios for the whole Company (exclusive South) are as follows:

TABLE NO. 2

FIRST SOUTHERN STATES MORTALITY INVESTIGATION 1927

YEARS OF ISSUE 1916–1925
YEARS OF EXPOSURE 1921–1925

AGES AT ISSUE	SELECT		ULTIMATE	
	Per cent. of Company's Total Select Exposure	Actual to Exp. (Am. Exp.) divided by same Ratio for whole Co. excl. So.	Per cent. of Company's Total Ultimate Exposure	Actual to Exp. (Am. Exp.) divided by same Ratio for whole Co. excl. So.
15–34	7.42	1.34	4.98	1.92
35–49	11.37	.92	12.82	1.31
50 and over	3.33	1.18	5.57	1.55
All Ages	22.12	1.04	23.41	1.39

TABLE NO. 3

SECOND SOUTHERN STATES MORTALITY INVESTIGATION 1929–1930

YEARS OF ISSUE 1916–1925
YEARS OF EXPOSURE 1921–1928

AGES AT ISSUE	SELECT		ULTIMATE	
	Per cent. of Company's Total Select Exposure	Actual to Exp. (Am. Exp.) divided by same Ratio for whole Co. excl. So.	Per cent. of Company's Total Ultimate Exposure	Actual to Exp. (Am. Exp.) divided by same Ratio for whole Co. excl. So.
15–34	6.96	1.10	4.31	1.19
35–49	11.06	1.25	12.74	1.22
50 and over	3.75	1.44	6.23	1.28
All Ages	21.77	1.27	23.28	1.17

In attempting to reconcile these figures in the above two tables the following possible explanation suggested itself to us: By adding three years of exposure without adding additional years of issue, we increased materially in the Select group the amount of exposure in the later portion of the five year Select

period, and added three years to the maximum exposure in the Ultimate group. The change in the ratios of actual to expected losses, caused evidently by the different distribution of the exposure, would seem to indicate that while during the first two policy years the mortality experience in the South is practically the same as that in the other parts of the United States, it rapidly becomes less favorable during the next three of four years when it reaches a peak, and then decreasing, gradually approaches the Northern experience without however, becoming quite as favorable.

The next step in our investigation was an endeavor to find the reasons for the high mortality in the Southern States. As a possible guide for this purpose we reviewed the death losses included in the Southern Mortality Investigation using all available information to determine accurately the primary cause of death for each claim. Then we tabulated the deaths according to causes by ages at issue, and also by ages attained at death, using the same age groupings in both tabulations, namely 15-34, 35-49, 50 and over, and all ages combined. From the tabulation by ages at issue we prepared a table of deaths by causes per one million dollars exposure (Table V), while the table of deaths by attained ages was used to find what percentage of all deaths was due to any particular disease or group of diseases (Table VI). The latter percentages, while not a very good measure of the importance of any disease, as any abnormal number of deaths due to a particular disease affects the percentages for all other diseases, were used, as similar tables could readily be prepared covering other material for purposes of comparison. As it would have required a great deal of labor to tabulate all deaths of the whole Company by causes, we took as a basis of comparison "The Mortality Statistics 1927" issued by the Bureau of Census (28th Annual Report) and determined from table 17 therein (Causes of Death by Age, Sex and Color), the number of deaths by diseases for each group. The deaths among white males were used to which we added 1.5% of the deaths of white females, as it was found that about 1.5% of the persons whose

deaths were recorded in the Southern Mortality Investigation were females. Table VI gives for each age group the percentages of total deaths for each cause of death. The groupings of the various diseases under the principal headings in the Government Report were slightly altered to conform exactly with the groupings used in the Medical Department of The Union Central.

Table VII shows similar percentages by lives for The Union Central southern business, and a comparison of this Table with Table VI may be found quite interesting. The outstanding feature is the fact that the percentages for suicide, homicide and other violent causes of death in the south are greater than those for the general population in the registration area, namely 20.86% for the former and only 12.62% for the latter. The same applies to each individual State, as the following table indicates:

TABLE NO. 4

PERCENTAGES OF VIOLENT DEATHS TO TOTAL DEATHS (LIVES)

State	Suicide	Homicide	Other Violent Deaths	All Violent Deaths
Alabama	6.55	3.57	8.93	19.05
Arkansas	2.08	2.08	12.50	16.67
Florida	6.25	4.17	14.58	25.00
Georgia	7.95	2.09	12.55	22.59
Louisiana	5.38	1.54	14.62	21.54
Mississippi	8.75	2.50	8.75	20.00
N. Carolina	3.37	1.12	10.11	14.61
Oklahoma	4.65	9.30	20.93	34.88
S. Carolina	3.08	3.08	7.69	13.85
Texas	8.56	2.14	12.54	23.24
Total—South	6.27	2.57	12.02	20.86

In comparing the figures in the above table with the corresponding ratios for the registration area, it must be taken into consideration that a lower violent death rate should be experienced in a Company not writing industrial business than is found in the general population. It would, therefore, be no exaggeration to say that the violent death rate in the south is at least twice the normal. If one-half of the deaths from external causes could have been eliminated, the southern mortality experience of the Company would have been only slightly higher than the Company's average.

For sake of further study Table VIII was then prepared, which gives similar percentages by attained ages for lives, policies and amounts, and for the Select and Ultimate business separate. A strong selection against the Company is indicated, as for the Select group the violent death percentages by amounts are much higher than those by lives. This applies to all age groups except the youngest, where only a slight difference is noted. The suicides were tabulated by durations. By amounts the largest number appeared in the second policy year, namely 22.35%, while by lives the corresponding percentage was only 11.11%. More than one-half the suicides had occurred during the first four policy years both by lives and amounts. For first year suicides the amounts entered were those actually paid by the Company.

The comparatively high percentages of deaths caused by diseases of the digestive system seem to point to dietary faults. In this connection one cannot help thinking of the large amounts of hot bread consumed in the South, usually washed down with great quantities of ice water.

Malaria and Typhoid fever deaths in the South were, of course, observed with particular interest. While the deaths from these diseases were small in number, causing only $36.00 and $51.00 respectively of losses per one million dollars of exposure (Table V), the percentages of deaths from Malaria and Typhoid fever to all deaths in the South were eight and one-half and five times respectively the corresponding percentages for the registration area.

The comparatively high death rate from Malaria suggests that this disease may be quite prevalent in the South, causing physical degenerations, which are the fore-runners of fatal diseases. The physicians preparing the death loss papers may often make no mention of the previous malaria and give other diseases as the primary causes of death.

The percentage for organic heart disease is low in the South, namely 7.56% against 18.80% for the registration area. This may be due to the small percentage of old people among insured lives as compared with the percentage of old people found in

the general population. Also less accuracy is probably found in the usual death reports made to city and county authorities than in the more elaborate claim papers demanded by an insurance company. "Heart Disease" may often save the time necessary for a more accurate diagnosis.

The percentage for Cirrhosis of the Liver is larger than the corresponding percentage in the general population. Would this indicate an excessive use of poor grades of alcoholic beverages in the South?

Syphilis and the allied diseases, Locomotor Ataxia and General Paralysis of the insane, have low percentages, due perhaps to the prevalence of Malaria.

The following Tables were prepared with great care, and, we believe, are as accurate as the underlying material permits. We hope that our efforts will bring about further studies of the mortality in the South. Perhaps means may be found by which the southern mortality can be reduced—at least for insured lives.

TABLE I

SOUTHERN STATES MORTALITY INVESTIGATION 1929–1930.
Whole Company, Whole Company Excluding South and South
ISSUES 1916 TO 1925 INC. EXPOSURES 1921 TO 1928.

Ages at Issue	DIVISION	EXPOSURE (nearest $1000)		EXPECTED LOSSES				ACTUAL LOSSES		Ratio of Actual to expected			
				AMER. EX.		AMER. MEN				AMER. EX.		AMER. MEN.	
		Select	Ultimate	Select	Ultimate	Select	Ultimate	Select	Ultimate	Select	Ultimate	Select	Ultimate
15–34	Whole Co.	1212933	344167	10062409	2896891	4833757	1531551	2681156	904761	.26645	.31232	.55467	.59074
15–34	South	278487	86369	2308554	725946	1107914	383730	662000	258000	.28675	.35539	.59751	.67234
15–34	Whole Co. Exc. South	934446	257798	7753855	2170945	3725843	1147821	2019156	646761	.26040	.29791	.54193	.56346
35–49	Whole Co.	1992269	1013522	20526914	10579394	11580157	6947012	7821515	4323881	.38103	.40870	.67542	.62240
35–49	South	442883	255142	4550849	2655565	2550996	1737701	2057500	1252500	.45211	.47165	.80371	.72077
35–49	Whole Co. Exc. South	1549386	758380	15976065	7923829	9029161	5209311	5764015	3071381	.36079	.38761	.63901	.58959
50 & over	Whole Co.	708276	644874	15846844	14461261	12378404	13795549	8352875	10987138	.52710	.75976	.67479	.79642
50 & over	South	150235	124662	2895743	2610725	2248858	2467052	2034000	2411500	.70241	.92368	.90445	.97748
50 & over	Whole Co. Exc. South	648041	520212	12951101	11850536	10129546	11328497	6318875	8575638	.48790	.72364	.62380	.75699
All Ages	Whole Co.	4003478	2002564	46436167	27937546	28792318	22274112	18855546	16215780	.40605	.58042	.65488	.72801
All Ages	South	871605	466173	9755146	5992236	5916768	4588483	4753500	3922000	.48728	.65451	.80339	.85474
All Ages	Whole Co. Exc. South	3131873	1536391	36681021	21945310	22875550	17685629	14102046	12293780	.38445	.56020	.61646	.69512

TABLE II

SOUTHERN STATES MORTALITY INVESTIGATION 1929–1930

TABLE II

SOUTHERN STATES MORTALITY INVESTIGATION 1929–1930

Issues 1916 to 1925 inc. Exposures 1921 to 1928

Age at issue	State	Exposure (nearest $1000)		Expected Losses				Actual Losses		Ratio of Actual to Expected			
				Amer. Ex.		Amer. men				Amer. Ex.		Amer. men	
		Select	Ultimate	Select	Ultimate	Select	Ultimate	Select	Ultimate	Select	Ultimate	Select	Ultimate
15-34	Alabama	28972	10105	239623	84802	115004	44837	75000	37000	.31299	.43631	.65215	.82521
35-49	"	43674	27423	449295	286974	252958	180038	204500	113500	.45515	.39550	.80843	.60040
50 & over	"	14194	15128	264117	313426	203835	295806	174500	306500	.66069	.97790	.85608	1.03583
All Ages	"	86840	52656	953035	685202	571797	529771	454000	457000	.47637	.66695	.79398	.86263
15-34	Arkansas	23617	7599	195679	63632	93856	33632	56000	10000	.28618	.15715	.59665	.29733
35-49	"	42582	21917	439440	229806	248316	151715	203000	126000	.46195	.54828	.81750	.83050
50 & over	"	15180	11922	275202	251077	211597	237894	210500	331000	.76489	1.31821	.99481	1.39137
All Ages	"	81379	41438	910321	544535	553769	423241	469500	467000	.51575	.85761	.84782	1.10339
15-34	Florida	11589	2179	96334	18358	46307	9707	15500	8500	.16089	.46301	.33472	.87565
35-49	"	18958	5907	196651	61040	111761	39016	63000	20000	.32036	.32765	.56370	.50484
50 & over	"	7515	2972	138166	61241	106167	57873	110000	62000	.79614	1.01151	1.03610	1.07121
All Ages	"	38062	11058	431151	140692	264235	107201	188500	90500	.43729	.64324	.71338	.84420
15-34	Georgia	49585	16991	411303	142757	197113	75470	122500	94500	.29783	.66196	.62147	1.25215
35-49	"	80866	59637	925145	625826	521503	413529	529500	352500	.57234	.56325	1.01533	.85241
50 & over	"	28438	24925	548626	512705	426720	482717	363000	507000	.66165	.98869	.85067	1.05030
All Ages	"	167889	101553	1885074	1281378	1145336	971716	1015000	954000	.53844	.74451	.88627	.98176
15-34	Louisiana	21154	6675	174467	55081	83433	29524	54000	18000	.30951	.32211	.64685	.60967
35-49	"	34927	20525	362707	214856	206346	141516	86500	88500	.23848	.41190	.41919	.62537
50 & over	"	14278	12539	286402	255416	223472	240478	326500	190500	1.14000	.74584	1.46103	.79217
All Ages	"	70359	39739	823576	526153	513301	411518	467000	297000	.56703	.56447	.90979	.72171
15-34	Mississippi	12362	3507	102340	29424	49101	15549	27500	3500	.26871	.11895	.56007	.22509
35-49	"	19760	13405	204400	141093	115777	98571	97500	115500	.47700	.81866	.84213	1.23435

TABLE II—(Continued)

SOUTHERN STATES MORTALITY INVESTIGATION 1929–1930

Issues 1916 to 1925 inc. Exposures 1921 to 1928

Age at issue	State	Exposure (nearest $1000)		Expected Losses				Actual Losses		Ratio of Actual to Expected			
				Amer. Ex.		Amer. men				Amer. Ex.		Amer. men	
		Select	Ultimate	Select	Ultimate	Select	Ultimate	Select	Ultimate	Select	Ultimate	Select	Ultimate
50 & over	Mississippi	8000	7214	157368	163686	122732	156329	54500	170500	.34632	1.04162	.44405	1.09064
All Ages	"	40122	24126	464108	334193	287610	265449	179500	289500	.38676	.86626	.62410	1.09060
15-34	No. Carolina	14582	4388	120126	36824	57652	19477	53000	10000	.44120	.27156	.91930	.51342
35-49	"	21624	10039	223702	104018	126698	67692	29500	26500	.13187	.25476	.23283	.39147
50 & over	"	8596	6544	183752	155347	145163	149206	65500	126500	.35645	.81430	.45121	.84782
All Ages	"	44802	20971	527580	296189	329513	236375	148000	163000	.28052	.55032	.44914	.68958
15-34	Oklahoma	9873	1794	81645	15082	39078	7942	43000		.52667		1.10036	
35-49	"	20397	8657	213160	91429	122019	60850	123000	22000	.57700	.24062	1.00803	.36154
50 & over	"	10984	5819	228497	125772	179707	120347	324000	191000	1.41796	1.51862	1.80293	1.58707
All Ages	"	41254	16270	523311	232283	340804	189139	490000	213000	.93634	.91698	1.43777	1.12615
15-34	So. Carolina	8261	3670	68337	30884	32825	16333	17500	5500	.25608	.17808	.53313	.33674
35-49	"	10192	7680	106820	79513	61382	51743	92000	36000	.86126	.45275	1.49881	.69574
50 & over	"	5121	5042	102668	111767	80204	106163	44000	65000	.42856	.58156	.54860	.61226
All Ages	"	23574	16392	277825	222164	174411	174239	153500	106500	.55250	.47937	.88010	.61122
15-34	Texas	98492	29461	818700	248302	393495	131259	198000	71000	.24184	.28594	.50318	.54091
35-49	"	140903	79952	1429520	821020	793236	528431	629000	352000	.44000	.42873	.79295	.66612
50 & over	"	37929	32557	710045	660125	549261	620144	361500	461500	.50847	.69911	.65815	.74418
All Ages	"	277324	141970	2959165	1729447	1735992	1279834	1188500	884500	.40163	.51143	.68462	.69110
15-34	All States	278487	86369	2308554	725946	1107914	383730	662000	258000	.28675	.35539	.59751	.67234
35-49	"	442883	255142	4550849	2655565	2559996	1737701	2057500	1252500	.45211	.47165	.80371	.72077
50 & over	"	150235	124662	2895743	2610725	2248858	2467052	2034000	2411500	.70241	.92368	.90445	.97748
All Ages	"	871605	466173	9755146	5992236	5916768	4588483	4753500	3522000	.48728	.65451	.80339	.85474

TABLE III A

SOUTHERN STATES MORTALITY INVESTIGATION

1929-1930

ISSUES 1916 to 1925 EXPOSURES 1921 to 1928

SELECT

ALL AGES AT ISSUE

		Per cent. of Company's total select Exposure	Actual to Expected		Actual to Exp. (Am. Exp.) divided by same ratio for whole Co. excluding South
			Am.Exp.	Am.Men	
Whole Company		100.00	40.61	65.49	1.06
" " Excl. South		78.23	38.45	61.65	1.00
Gulf Counties	Urban	2.58	42.45	69.49	1.10
" "	Rural	1.34	36.70	62.45	.95
" "	Total	3.92	40.57	67.25	1.06
Delta Counties	Urban	.18	14.91	25.07	.39
" "	Rural	.80	40.78	66.28	1.06
" "	Total	.98	36.28	59.32	.94
Coast Counties	Urban	.24	50.82	92.30	1.32
" "	Rural	.01	144.65	257.51	3.76
" "	Total	.24	52.85	95.96	1.37
Combined Gulf, Delta and Coast Counties	Urban	3.00	41.46	68.43	1.08
	Rural	2.14	38.53	64.39	1.00
	Total	5.14	40.25	66.78	1.05
Inland Counties	Urban	9.82	49.08	80.77	1.28
" "	Rural	6.81	54.55	89.77	1.42
" "	Total	16.63	51.32	84.45	1.33
All South	Urban	12.81	47.30	77.89	1.23
" "	Rural	8.96	50.78	83.88	1.32
" "	Total	21.77	48.73	80.34	1.27

TABLE III B

SOUTHERN STATES MORTALITY INVESTIGATION

1929-1930

ISSUES 1916 to 1925 EXPOSURES 1921 to 1928

SELECT

AGES AT ISSUE 15–34

		Per cent. of Company's total select Exposure	Actual to Expected		Actual to Exp. (Am. Exp.) divided by same ratio for whole Co. excluding South
			Am.Exp.	Am.Men	
Whole Company		30.30	26.65	55.47	1.02
" " Excl. South		23.34	26.04	54.19	1.00
Gulf Counties	Urban	.81	5.93	12.35	.23
" "	Rural	.51	17.61	36.73	.68
" "	Total	1.32	10.41	21.68	.40
Delta Counties	Urban	.06	9.80	20.38	.38
" "	Rural	.23	15.66	32.69	.60
" "	Total	.29	14.42	30.10	.55
Coast Counties	Urban	.13	69.92	146.77	2.69
" "	Rural	.01	....	....	....
" "	Total	.13	68.69	144.16	2.64
Combined Gulf, Delta and Coast Counties	Urban	1.00	14.30	29.78	.55
	Rural	.74	16.94	35.36	.65
	Total	1.74	15.42	32.14	.59
Inland Counties	Urban	2.85	29.13	60.66	1.12
" "	Rural	2.36	37.93	79.06	1.46
" "	Total	5.21	33.09	68.95	1.27
All South	Urban	3.85	25.29	52.66	.97
" "	Rural	3.10	32.91	68.63	1.26
" "	Total	6.96	28.68	59.75	1.10

TABLE III C

SOUTHERN STATES MORTALITY INVESTIGATION

1929-1930

ISSUES 1916 to 1925 EXPOSURES 1921 to 1928

SELECT

AGES AT ISSUE 35–49

		Per cent. of Company's total select Exposure	Actual to Expected		Actual to Exp. (Am. Exp.) divided by same ratio for whole Co. excluding South
			Am.Exp.	Am.Men	
Whole Company		49.76	38.10	67.54	1.06
" " Excl. South		38.70	36.08	63.90	1.00
Gulf Counties	Urban	1.32	31.20	55.73	.86
" "	Rural	.64	38.63	69.55	1.07
" "	Total	1.96	33.63	60.23	.93
Delta Counties	Urban	.09	....	....	....
" "	Rural	.42	51.51	90.83	1.43
" "	Total	.51	42.21	74.29	1.17
Coast Counties	Urban	.09	34.17	62.24	.95
" "	Rural	.01	290.42	524.48	8.05
" "	Total	.09	41.20	75.04	1.14
Combined Gulf, Delta and Coast Counties	Urban	1.50	29.43	52.55	.82
	Rural	1.06	44.36	79.20	1.23
	Total	2.56	35.63	63.63	.99
Inland Counties	Urban	5.19	47.93	85.32	1.33
" "	Rural	3.31	48.32	85.43	1.34
" "	Total	8.50	48.08	85.36	1.33
All South	Urban	6.69	43.80	78.02	1.21
" "	Rural	4.37	47.36	83.93	1.31
" "	Total	11.06	45.21	80.37	1.25

TABLE III D

SOUTHERN STATES MORTALITY INVESTIGATION

1929-1930

ISSUES 1916 to 1925 EXPOSURES 1921 to 1928

SELECT

AGES AT ISSUE 50 AND OVER

		Per cent. of Company's total select Exposure	Actual to Expected		Actual to Exp. (Am. Exp.) divided by same ratio for whole Co. excluding South
			Am.Exp.	Am.Men	
Whole Company		19.94	52.71	67.48	1.08
" " Excl. South		16.19	48.79	62.38	1.00
Gulf Counties	Urban	.45	85.91	109.82	1.76
" "	Rural	.19	55.68	71.86	1.14
" "	Total	.64	77.47	99.29	1.59
Delta Counties	Urban	.03	51.48	67.03	1.06
" "	Rural	.15	41.31	53.15	.85
" "	Total	.18	42.70	55.06	.88
Coast Counties	Urban	.02	37.43	48.75	.77
" "	Rural	.00	---	---	---
" "	Total	.02	36.73	47.79	.75
Combined Gulf, Delta and Coast Counties	Urban	.50	82.53	105.69	1.69
	Rural	.34	49.16	63.35	1.01
	Total	.84	69.42	89.12	1.42
Inland Counties	Urban	1.77	65.24	84.40	1.34
" "	Rural	1.15	78.12	100.12	1.60
" "	Total	2.92	70.48	90.84	1.44
All South	Urban	2.27	69.24	89.36	1.42
" "	Rural	1.48	71.72	92.04	1.47
" "	Total	3.75	70.24	90.44	1.44

TABLE IV A

SOUTHERN STATES MORTALITY INVESTIGATION

1929-1930

ISSUES 1916 to 1925 EXPOSURES 1921 to 1928

ULTIMATE

ALL AGES AT ISSUE

		Per cent. of Company's total ultimate Exposure	Actual to Expected		Actual to Exp. (Am. Exp.) divided by same ratio for whole Co. excluding South
			Am.Exp.	Am.Men	
Whole Company		100.00	58.04	72.80	1.04
" " Excl. South		76.72	56.02	69.51	1.00
Gulf Counties	Urban	2.18	46.22	59.94	.83
" "	Rural	1.20	86.79	118.33	1.55
" "	Total	3.37	59.89	78.97	1.07
Delta Counties	Urban	.24	34.00	44.46	.61
" "	Rural	1.06	79.06	100.13	1.41
" "	Total	1.30	70.94	90.36	1.27
Coast Counties	Urban	.19	64.17	89.80	1.15
" "	Rural	.01	243.55	300.12	4.35
" "	Total	.20	72.10	100.29	1.29
Combined Gulf, Delta and Coast Counties	Urban	2.61	46.26	60.32	.83
	Rural	2.26	83.50	109.63	1.49
	Total	4.87	63.44	82.98	1.13
Inland Counties	Urban	10.07	68.90	90.37	1.23
" "	Rural	8.34	62.54	81.17	1.12
" "	Total	18.41	65.98	86.13	1.18
All South	Urban	12.68	64.18	84.08	1.15
" "	Rural	10.60	66.95	87.11	1.20
" "	Total	23.28	65.45	85.47	1.17

TABLE IV B

SOUTHERN STATES MORTALITY INVESTIGATION

1929-1930

ISSUES 1916 to 1925 EXPOSURES 1921 to 1928

ULTIMATE

AGES AT ISSUE 15–34

		Per cent. of Company's total ultimate Exposure	Actual to Expected		Actual to Exp. (Am. Exp.) divided by same ratio for whole Co. excluding South
			Am.Exp.	Am.Men	
Whole Company		17.19	31.23	59.07	1.05
" " Excl. South		12.88	29.79	56.35	1.00
Gulf Counties	Urban	.37	25.69	48.60	.86
" "	Rural	.27	44.60	84.48	1.50
" "	Total	.64	33.72	63.82	1.13
Delta Counties	Urban	.04	....	....	....
" "	Rural	.16	....	....	....
" "	Total	.20	....	....	....
Coast Counties	Urban	.06	23.49	44.44	.79
" "	Rural	.00	....	....	....
" "	Total	.06	23.04	43.58	.77
Combined Gulf, Delta and Coast Counties	Urban	.47	23.16	43.80	.78
	Rural	.44	27.88	52.78	.94
	Total	.91	25.42	48.11	.85
Inland Counties	Urban	1.63	43.29	81.91	1.45
" "	Rural	1.77	33.60	63.54	1.13
" "	Total	3.40	38.25	72.36	1.28
All South	Urban	2.10	38.76	73.33	1.30
" "	Rural	2.21	32.47	61.41	1.09
" "	Total	4.31	35.54	67.23	1.19

TABLE IV C

SOUTHERN STATES MORTALITY INVESTIGATION

1929-1930

ISSUES 1916 to 1925 EXPOSURES 1921 to 1928

ULTIMATE

AGES AT ISSUE 35–49

		Per cent. of Company's total ultimate Exposure	Actual to Expected		Actual to Exp. (Am. Exp.) divided by same ratio for whole Co. excluding South
			Am.Exp.	Am.Men	
Whole Company		50.61	40.87	62.24	1.05
" " Excl. South		37.87	38.76	58.96	1.00
Gulf Counties	Urban	1.18	22.84	35.18	.59
" "	Rural	.66	37.36	58.03	.96
" "	Total	1.85	28.03	43.30	.72
Delta Counties	Urban	.14	37.38	56.80	.96
" "	Rural	.58	81.56	122.61	2.10
" "	Total	.72	73.04	110.03	1.88
Coast Counties	Urban	.09	57.49	91.27	1.48
" "	Rural	.01	....	....	....
" "	Total	.09	54.98	87.04	1.42
Combined Gulf, Delta and Coast Counties	Urban	1.42	26.46	40.77	.68
	Rural	1.25	58.14	88.90	1.50
	Total	2.67	41.38	63.53	1.07
Inland Counties	Urban	5.83	43.39	66.06	1.12
" "	Rural	4.24	56.01	85.78	1.45
" "	Total	10.08	48.69	74.32	1.26
All South	Urban	7.25	40.11	61.21	1.03
" "	Rural	5.49	56.50	86.49	1.46
" "	Total	12.74	47.17	72.08	1.22

TABLE IV D

SOUTHERN STATES MORTALITY INVESTIGATION

1929-1930

ISSUES 1916 to 1925 EXPOSURES 1921 to 1928

ULTIMATE

AGES AT ISSUE 50 AND OVER

		Per cent. of Company's total ultimate Exposure	Actual to Expected		Actual to Exp. (Am. Exp.) divided by same ratio for whole Co. excluding South
			Am.Exp.	Am.Men	
Whole Company		32.20	75.98	79.64	1.05
" " Excl. South		25.97	72.36	75.70	1.00
Gulf Counties	Urban	.62	73.14	77.49	1.01
" "	Rural	.26	168.62	179.84	2.33
" "	Total	.88	100.79	106.99	1.39
Delta Counties	Urban	.06	39.10	41.49	.54
" "	Rural	.31	92.60	97.11	1.28
" "	Total	.37	83.84	88.09	1.16
Coast Counties	Urban	.04	99.97	106.11	1.38
" "	Rural	.01	494.56	502.01	6.83
" "	Total	.04	124.13	131.38	1.72
Combined Gulf, Delta and Coast Counties	Urban	.72	71.50	75.77	.99
	Rural	.57	127.29	134.45	1.76
	Total	1.29	96.41	102.02	1.33
Inland Counties	Urban	2.61	104.46	110.85	1.44
" "	Rural	2.32	77.05	81.30	1.06
" "	Total	4.93	91.30	96.62	1.26
All South	Urban	3.33	97.21	103.12	1.34
" "	Rural	2.90	86.98	91.80	1.20
" "	Total	6.23	92.37	97.75	1.28

TABLE V

SOUTHERN STATES MORTALITY INVESTIGATION 1929-1930

TEN SOUTHERN STATES

ISSUES 1916 to 1925 EXPOSURES 1921 to 1928

Death Losses by Cause per $1,000,000 Exposure

CAUSE OF DEATH	CODE	AGES AT ISSUE 15–34	35–49	50 and Over	All Ages
Typhoid	1	$ 134	$ 24	$ 7	$ 51
Malaria	3	37	32	47	36
Influenza	5	107	95	93	98
Pellagra	16	11	30	7	20
Tuberculosis of Lungs	17	415	174	207	246
Syphilis	19	11	11	18	13
Cancer	21	130	532	984	515
Anaemia	25	10	185	65	113
Other General Diseases		199	150	167	167
General Diseases ....Total		1054	1233	1597	1259
Locomotor Ataxia	31	41	4		13
Cerebral Hemorrhage	33	63	511	791	447
General Paralysis of Insane	36	37	36	29	35
Other Diseases of Nervous System....		125	114	120	118
Diseases of Nervous System .....Total		266	665	940	613
Organic Heart Disease	43	299	415	2035	716
Angina Pectoris	44	178	408	745	414
Other Diseases of Circulatory System		159	348	806	391
Diseases of Circulatory System....Total		636	1170	3586	1521
Pneumonia 50–51		293	352	246	314
Other Diseases of Respiratory System		34	57	80	55
Diseases of Respiratory System....Total		328	408	326	369
Cirrhosis of Liver	63	8	84	15	49
Other Diseases of Digestive System..		417	615	424	521
Diseases of Digestive System.....Total		425	698	438	570
Nephritis and Bright's Disease.....	68	111	260	478	264
Other Non-Venereal Genito-Urinary Diseases		44	135	73	97
Non-Venereal Genito-Urinary Diseases ..... Total		155	395	551	361
The Puerperal State .....Total		11			3
Diseases of Skin and Cellular Tissue.... ..... Total		3	8		5
Diseases of Bones and Joints.....Total			5	73	18
Old Age .....Total					
Suicide	81	363	628	709	572
Homicide	89	80	165	55	147
Other External Causes		815	825	1422	945
Affections produced by External Causes ..... Total		1358	1618	2186	1664
Ill-Defined Diseases .....Total		11	84	318	112
All Causes of Death .....TOTAL		4246	6285	10016	6496

TABLE VI

"MORTALITY STATISTICS" 1927—BUREAU OF CENSUS

WHITE MALES AND 1.5% WHITE FEMALES

Percentages of Deaths from Cause

CAUSE OF DEATH	CODE	AGES AT DEATH 15–34	35–49	50 and Over	All Ages
Typhoid Fever	1	1.90	.60	.12	.42
Malaria	3	.20	.12	.07	.09
Influenza	5	1.88	1.76	1.51	1.60
Pellagra	16	.12	.21	.17	.17
Tuberculosis of Lungs	17	18.35	12.92	2.97	6.52
Syphilis	19	.59	1.37	.45	.62
Cancer	21	2.15	6.57	11.15	9.28
Anaemia	25	.23	.38	.51	.45
Other General Diseases		6.58	5.92	3.57	4.33
General Diseases ....Total		32.00	29.85	20.52	23.48
Locomotor Ataxia	31	.03	.22	.26	.22
Cerebral Hemorrhage	33	.64	3.02	11.07	8.45
General Paralysis of Insane	36	.55	2.29	.44	.76
Other Diseases of Nervous System		4.09	2.59	1.87	2.26
Diseases of Nervous System....Total		5.30	8.12	13.63	11.69
Organic Heart Disease	43	5.52	10.42	23.05	18.80
Angina Pectoris	44	.24	1.60	2.71	2.23
Other Diseases of Circulatory System		1.99	3.02	5.30	4.52
Diseases of Circulatory System....Total		7.75	15.05	31.07	25.54
Pneumonia 50–51		6.56	7.75	5.42	5.95
Other Diseases of Respiratory System		1.08	1.35	1.26	1.25
Diseases of Respiratory System....Total		7.64	9.09	6.68	7.20
Cirrhosis of Liver	63	.28	1.18	1.10	1.02
Other Diseases of Digestive System..		8.65	7.79	3.92	5.14
Diseases of Digestive System....Total		8.94	8.97	5.02	6.16
Nephritis and Bright's Disease	68	2.95	6.08	11.66	9.66
Other Non-Venereal Genito-Urinary Diseases		.43	.65	2.12	1.67
Non-Venereal Genito-Urinary Diseases ....Total		3.38	6.73	13.77	11.33
The Puerperal State ....Total		.22	.06		.04
Diseases of Skin and Cellular Tissue.... Total		.23	.25	.29	.28
Diseases of Bones and Joints....Total		.55	.26	.11	.19
Old Age ....Total				1.20	.85
Suicide	81	3.72	4.31	1.51	2.25
Homicide	89	3.04	1.66	.21	.80
Other External Causes		26.83	15.08	5.30	9.58
Affections produced by External Causes .... Total		33.60	21.05	7.02	12.62
Ill-Defined Diseases ....Total		.39	.56	.68	.63

TABLE VII

SOUTHERN STATES MORTALITY INVESTIGATION 1929-1930

TEN SOUTHERN STATES

ISSUES 1916 to 1925 EXPOSURES 1921 to 1928

LIVES—SELECT AND ULTIMATE COMBINED

Percentages of Deaths from Cause

CAUSE OF DEATH	CODE	ATTAINED AGES 15–34	35–49	50 and Over	All Ages
Typhoid Fever	1	6.34	1.67	.19	2.04
Malaria	3	.75	.37	1.17	.76
Influenza	5	2.99	3.33	1.75	2.65
Pellagra	16	.37	.74	.39	.53
Tuberculosis of Lungs	17	11.94	6.85	3.50	6.58
Syphilis	19	1.12	.37	.19	.45
Cancer	21	2.99	6.67	11.26	7.71
Anaemia	25	.75	.74	1.36	.98
Other General Diseases		3.73	3.70	2.91	3.40
General Diseases ..... Total		30.97	24.44	22.72	25.09
Locomotor Ataxia	31		.37		.15
Cerebral Hemorrhage	33	1.12	4.63	10.10	6.05
General Paralysis of Insane	36		.93	.78	.68
Other Diseases of Nervous System		2.24	4.26	2.91	3.33
Diseases of Nervous System ..... Total		3.36	10.19	13.79	10.20
Organic Heart Disease	43	4.10	6.85	10.10	7.56
Angina Pectoris	44	1.12	3.70	7.57	4.69
Other Diseases of Circulatory System		2.99	4.81	6.21	4.99
Diseases of Circulatory System..... Total		8.21	15.37	23.88	17.23
Pneumonia	50–51	8.58	7.59	5.05	6.80
Other Diseases of Respiratory System		.37	.93	1.36	.98
Diseases of Respiratory System.... Total		8.96	8.52	6.41	7.79
Cirrhosis of Liver	63		.93	.97	.76
Other Diseases of Digestive System..		10.82	10.56	6.60	9.07
Diseases of Digestive System..... Total		10.82	11.48	7.57	9.83
Nephritis and Bright's Disease.....	68	1.12	4.07	8.74	5.29
Other Non-Venereal Genito-Urinary Diseases		1.12	.19	1.36	.83
Non-Venereal Genito-Urinary Diseases ..... Total		2.24	4.26	10.10	6.12
The Puerperal State ..... Total		.75	.19		.23
Diseases of Skin and Cellular Tissues.... ..... Total		.37	.37		.23
Diseases of Bones and Joints..... Total			.37	.19	.23
Old Age ..... Total					
Suicide	81	7.46	7.04	4.85	6.27
Homicide	89	5.60	2.59	.97	2.57
Other External Causes		20.90	12.78	6.60	12.02
Affections Produced by External Causes ..... Total		33.96	22.41	12.43	20.86
Ill-Defined Diseases ..... Total		.37	2.41	2.91	2.19

TABLE VIII

SOUTHERN STATES MORTALITY INVESTIGATION 1929–1930

Ten Southern States

ISSUES 1916–1925 EXPOSURES 1921–1928

Percentages of Deaths from Cause

CAUSE OF DEATHS	Code	ATTAINED AGES											
		15–34						35–49					
		SELECT			ULTIMATE			SELECT			ULTIMATE		
		Lives	Pol's	Amts	Lives	Pol's	Amts	Lives	Pol's	Amts	Lives	Pol's	Amts
Typhoid Fever	1	7.24	6.78	4.59	3.62	3.55	3.65	1.99	1.62	.87	1.26	.81	.64
Malaria	3	1.01	1.25	2.03				.66	.92	.68			
Influenza	5	2.76	2.67	2.48	3.62	2.54	2.69	3.49	2.66	2.25	3.14	2.57	1.51
Pellagra	16	.56	.41	.15				.17	.12	.05	1.46	.96	1.75
Tuberculosis of Lungs	17	11.31	10.88	9.11	13.77	13.71	10.75	4.32	3.82	2.25	10.04	9.07	8.34
Syphilis	19	.23	.21	.15	3.62	2.54	1.15	.66	.46	.15			
Cancer	21	1.76	1.85	1.84	6.52	6.60	3.55	6.98	7.63	7.71	6.28	9.20	9.13
Anaemia	25				2.90	2.03	1.34	.83	1.27	4.10	.63	.95	2.22
Other General Diseases		3.52	4.11	5.87	4.35	3.05	3.07	3.49	2.77	2.86	3.97	5.41	4.66
General Diseases Total		28.39	28.13	26.23	38.41	34.01	26.20	22.59	21.27	20.92	26.78	28.96	28.26
Locomotor Ataxia	31							.50	.81	.56	.21	.95	.52
Cerebral Hemorrhage	33	1.51	1.64	.90		1.02	.77	4.65	4.86	8.37	4.60	4.87	4.52
General Paralysis of Insane	36							.83	1.16	.81	1.05	1.35	1.23
Other Diseases of Nervous System		2.26	2.46	2.11	2.17	2.03	1.34	4.32	3.82	3.03	4.18	3.92	1.75
Diseases of Nervous System Total		3.77	4.11	3.01	2.17	3.05	2.11	10.30	10.64	12.77	10.04	11.10	8.13
Organic Heart Disease	43	4.02	5.34	7.26	4.35	5.08	4.03	6.15	6.47	5.39	7.74	8.39	10.46
Angina Pectoris	44	1.01	.82	1.66	1.45	2.03	19.19	4.22	4.51	3.37	2.93	2.30	2.35
Other Diseases of Circulatory System		2.51	2.05	3.24	4.35	4.06	1.54	4.32	3.47	3.05	5.44	5.95	4.10
Diseases of Circulatory System Total		7.54	8.21	12.15	10.14	11.17	24.76	14.78	14.45	11.81	16.11	16.64	16.91
Pneumonia	50–51	8.54	7.80	5.12	8.70	9.14	6.33	8.64	7.51	5.61	6.28	6.36	5.28
Other Diseases of Respiratory System		.50	.41	.38		2.03	1.54	.33	.23	.15	1.67	1.35	1.59
Diseases of Respiratory System Total		9.05	8.21	5.50	8.70	11.17	7.87	8.97	7.75	5.76	7.95	7.71	6.87

TABLE VIII—Continued

SOUTHERN STATES MORTALITY INVESTIGATION 1929–1930

Ten Southern States

ISSUES 1916–1925 EXPOSURES 1921–1928

Percentages of Deaths from Cause

CAUSE OF DEATHS	Code	ATTAINED AGES											
		50 and over						All Ages					
		SELECT			ULTIMATE			SELECT			ULTIMATE		
		Lives	Pol's	Amts	Lives	Pol's	Amts	Lives	Pol's	Amts	Lives	Pol's	Amts
Typhoid Fever	1				.31	.19	.08	2.96	2.35	1.02	1.03	.76	.50
Malaria	3	1.82	2.62	.71	.78	.87	.27	1.08	1.55	.88	.40	.46	.17
Influenza	5	1.82	1.23	.68	1.71	1.35	1.15	2.82	2.20	1.61	2.46	1.93	1.37
Pellagra	16	.52	.31	.05	.31	.19	.08	.36	.25	.03	.71	.46	.61
Tuberculosis of Lungs	17	8.38	3.23	2.04	3.57	2.99	2.01	6.06	5.34	3.12	7.14	6.34	4.61
Syphilis	19	.26	.77	.12	.16	.68	.31	.43	.50	.14	.48	.61	.27
Cancer	21	10.65	9.69	9.42	11.63	9.94	8.39	6.50	6.89	7.62	9.04	9.33	8.31
Anaemia	25	2.08	1.38	.81	.93	.68	.77	.94	1.00	2.12	1.03	.91	1.27
Other General Diseases		2.34	1.38	.39	3.26	2.41	2.12	3.18	2.65	2.22	3.65	3.60	3.00
General Diseases Total		22.86	20.62	14.22	22.64	19.31	15.19	24.33	22.73	18.80	25.93	24.39	20.09
Locomotor Ataxia	31							.22	.35	.24	.08	.35	.17
Cerebral Hemorrhage	33	10.39	9.69	5.20	9.92	10.14	10.53	5.34	5.64	5.98	6.82	7.25	7.97
General Paralysis of Insane	36	1.04	.62	.30	.62	.77	.29	.65	.70	.48	.71	.91	.60
Other Diseases of Nervous System		.78	.62	.15	4.19	3.47	2.20	2.74	2.45	1.67	3.97	3.50	2.00
Diseases of Nervous System Total		12.21	10.92	5.64	14.73	14.38	13.02	8.95	9.14	8.37	11.58	12.02	10.73
Organic Heart Disease	43	10.91	12.15	17.78	9.61	11.87	12.24	6.86	8.04	10.94	8.33	9.89	11.13
Angina Pectoris	44	8.57	10.46	9.76	6.98	7.34	8.11	4.55	5.54	5.86	4.84	4.92	7.01
Other Diseases of Circulatory System		3.64	3.08	3.96	7.75	9.07	12.51	3.61	3.00	3.47	6.50	7.40	9.10
Diseases of Circulatory System Total		23.12	25.69	31.50	24.34	28.28	32.86	15.02	16.58	20.27	19.67	22.21	27.23
Pneumonia	50–51	6.49	4.92	6.06	4.19	4.25	2.66	8.01	6.74	5.74	5.47	5.53	3.74
Other Diseases of Respiratory System		.78	.62	.74	1.71	1.54	1.22	.51	.40	.43	1.51	1.52	1.26
Diseases of Respiratory System Total		7.27	5.54	6.80	5.89	5.79	3.88	8.52	7.14	6.17	6.98	7.05	5.10

TABLE VIII—Continued

SOUTHERN STATES MORTALITY INVESTIGATION 1929–1930

Ten Southern States

ISSUES 1916–1925 EXPOSURES 1921–1928

Percentages of Deaths from Cause

CAUSE OF DEATHS	Code	ATTAINED AGES											
		15–34						35–49					
		SELECT			ULTIMATE			SELECT			ULTIMATE		
		Lives	Pol's	Amts	Lives	Pol's	Amts	Lives	Pol's	Amts	Lives	Pol's	Amts
Cirrhosis of Liver	63							.66	.58	.55	1.26	1.22	1.77
Other Diseases of Digestive System		12.31	13.35	14.00	6.52	7.61	4.80	11.63	10.06	6.94	9.21	7.17	7.71
Diseases of Digestive System Total		12.31	13.35	14.00	6.52	7.61	4.80	12.29	10.64	7.49	10.46	8.39	9.48
Nephritis and Brights Disease	68	1.26	1.03	.53	.72	.51	.58	3.32	3.70	1.60	5.02	4.06	4.49
Other Non-Venereal Genito-Urinary Diseases		1.01	1.03	.83	1.45	1.52	4.03	.17	.12	1.21	.21	.14	1.99
Non-Venereal Genito-Urinary Diseases Total		2.26	2.05	1.36	2.17	2.03	4.61	3.49	3.82	2.81	5.23	4.19	6.49
The Puerperal State Total		.56	.41	.15	1.45	1.02	.38				.42	.27	.16
Diseases of Skin and Cellular System Total					1.45	1.02	.38	.33	.23	.15	.42	.27	.20
Diseases of Bones and Organs of Locomotion Total								.33	.23	.12	.42	.27	.08
Old Age Total													
Suicide	81	7.79	8.21	11.44	6.52	8.12	7.68	6.64	8.21	12.55	7.53	5.55	6.14
Homicide	80	6.09	5.75	6.47	4.35	4.06	1.92	3.99	4.16	4.33	.84	2.44	2.61
Other Affections Produced by external Causes		22.36	21.56	19.69	16.67	15.74	18.52	14.45	17.11	20.74	10.67	11.37	12.39
Affections Produced by External Causes Total		36.18	35.52	37.60	27.54	27.92	28.12	25.08	29.48	37.61	19.04	19.35	21.63
Ill-Defined Diseases Total					1.45	1.02	.77	1.83	1.50	.56	3.14	2.84	1.79
All Causes of Death Total		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TABLE VIII—Continued

SOUTHERN STATES MORTALITY INVESTIGATION 1929–1930

Ten Southern States

ISSUES 1916–1925 EXPOSURES 1921–1928

Percentages of Deaths from Cause

CAUSE OF DEATHS	Code	ATTAINED AGES											
		50 and over						All Ages					
		SELECT			ULTIMATE			SELECT			ULTIMATE		
		Lives	Pol's	Amts	Lives	Pol's	Amts	Lives	Pol's	Amts	Lives	Pol's	Amts
Cirrhosis of Liver	63	1.30	1.54	.91	.78	1.35	.56	.65	.75	.62	.87	1.17	.91
Other Diseases of Digestive System		8.05	6.92	6.17	5.74	5.89	9.38	10.83	9.84	7.60	7.14	6.54	8.54
Diseases of Digestive System Total		9.35	8.46	7.08	6.51	7.24	9.94	11.48	10.59	8.22	8.01	7.71	9.45
Nephritis and Brights Disease	68	5.71	8.31	3.89	10.54	10.04	7.46	3.39	4.55	2.43	7.38	6.85	6.05
Other Non-Venereal Genito-Urinary Diseases		1.04	1.23	2.02	1.55	1.16	.95	.65	.70	1.50	1.03	.81	1.49
Non-Venereal Genito-Urinary Diseases Total		6.75	9.54	5.90	12.09	11.20	8.41	4.04	5.24	3.93	8.41	7.66	7.54
The Puerperal State Total								.14	.10	.02	.32	.20	.08
Diseases of Skin and Cellular System Total								.14	.10	.06	.32	.20	.09
Diseases of Bones and Organs of Locomotion Total					.31	.39	.83	.14	.10	.05	.32	.30	.53
Old Age Total													
Suicide	81	7.27	7.08	11.33	3.41	3.47	4.29	7.15	7.84	11.87	5.31	4.72	5.10
Homicide	89	1.30	1.54	.74	.78	.97	.46	3.83	3.70	3.09	1.19	1.83	1.24
Other Affections Produced by external Causes Total		7.53	7.38	14.65	6.05	5.02	8.21	14.80	15.03	17.99	8.96	8.47	10.39
Affections Produced by External Causes Total		16.10	16.00	26.72	10.23	9.46	12.95	25.78	26.57	32.96	15.46	15.01	16.73
Ill-Defined Diseases Total		2.34	3.23	2.14	3.26	3.96	2.92	1.44	1.70	1.16	3.01	3.25	2.42
All Causes of Death Total		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

DR. GROSVENOR—It is a pleasure to review a paper that displays so much evidence of care and thoroughness, not only in obtaining actual facts but in the study of the methods that will produce most illuminating results. A paper on this subject is also very welcome because of the great importance of the subject itself and because no recent experience on the subject has been published. The American-Canadian Mortality Investigation covered the experience from 1900 to 1915 and is somewhat out of date even as to the general mortality experience. Probably the experience in the Southern states in that investigation is much more out of date than the general experience. The most recent experience I happen to recollect was that given by Mr. Mervyn Davis on the mortality experience of the Equitable Life Assurance Society in the Transactions of the Actuarial Society, Volume XXIV, page 53. This included some experience of that society in Southern states up to the anniversary in 1919. In the case of the experience on issues of 1909 to 1918, included, the ratio of actual to expected among men in the Southern states was 94% compared with a ratio of 75% in the case of men in Northern states. The ratio between the ratios was 125%. This experience included all Southern states including Tennessee, Oklahoma, Texas and Virginia. The corresponding ratios in the case of women were 102% and 74%, the ratio between the ratios being 138%.

I regret very much that the company with which I am connected has no mortality experience by residence of the insured which could be compared with this.

Several questions of a technical nature arise in considering this paper, such as what probabilities of dying are used in the case of a select table when calculating expected deaths by calendar years where, during the select period, each calendar year is a mixture of two policy years. A less important question is whether expected deaths were calculated by individual ages or whether approximate results were obtained based on average probabilities of dying for the broad age groups shown in the paper. This question would not have much importance unless

the age distribution within the broad age groups varied considerably between the different states and the different groups of counties studied. Another question that does not appear to be answered in the context of the paper is whether the company's general experience which was used as a measuring rod was based on exactly the same years of issue and years of exposure as the experience studied in the Southern states. But inasmuch as the results given in the table stated to be a measuring rod are the same as the results given in Table I for the whole company excluding the South, it is apparent that the measuring rod used was based on the experience on issues of 1916 to 1925 exposed from 1921 to 1928, and that therefore this measuring rod is the best basis possible (with possibly one exception to be noted later). These questions, while of a technical nature, might be of importance in studying some published mortality experiences but, in view of the reputation of the authors, there is no doubt but what they have chosen methods that give results that are as accurate as justified by the reliability of the data itself.

There is one point in the presentation of the results that we would have handled differently. When it became evident that the mortality experience in Texas was approximately standard we would have excluded this business from the results shown for the Southern states as the authors have already done in the case of Tennessee. This point really makes an appreciable difference because instead of showing that the Select Mortality in the South is 27% higher than the mortality for the Whole Company (exclusive of the South) the ratio would have been 137% and the ratio in the case of the ultimate mortality would have been as excess of 32% instead of 17%. These ratios were obtained by transferring the actual and expected losses in Texas from the Southern mortality to that for the balance of the country. Of course, for some purposes mortality, including Texas, should be included but from the standpoint of underwriting risks in the balance of the South it appears as if it might be better to consider that the mortality in the balance of the South had been about 35% higher than the standard (37% in the select period

and 32% in the ultimate) than to consider that in the South, including Texas, it had been 27% higher in the select period and 17% in the ultimate period.

While the authors are careful to point out that the results in Tables III and IV must be studied in conjunction with the small amount of experience in the different subdivisions, it would seem as if the final ratios between the experience in these divisions and the general measuring rod mortality might have been based on the American Men table instead of on the American Experience table. In Table III A the ratios in the final column indicate that the select mortality, all ages combined, in the rural sections, Gulf counties, was more favorable than the Northern experience, while this experience, studied in the light of the American Men table, appears to be slightly less favorable than the Northern experience. Similarly it appears that the mortality in the rural sections of the Coast counties in the select period was 3.76 times what it would have been if it were the same as the Northern experience while this ratio appears as 4.18 if calculated on the American Men table. Results on the American Experience table appear to be less illuminating than under the American Men table. Similarly in the case of Table IV A covering the ultimate experience, it appears from the final column of ratios that the total experience in the Coast counties is only two points worse than that in the Delta counties while if these ratios had been calculated by the American Men table there would have been a difference of 14 points. It is possible that the results shown are within the limits of error to which the data is subject because of the lack of sufficient exposure, but, nevertheless, it would seem worth while to have shown these results compared on the basis of the American Men table instead of on the American Experience table. Perhaps it should be pointed out that, in commenting on the changes that would have been made, it is necessary for me to use the data as published instead of modifying it by the switch of Texas business from the South, because no data was at hand as to the division of Texas business by counties.

The authors deduce that the mortality experience was not as favorable in rural sections as in urban sections. It might be pointed out that the real difference is possibly considerably greater than that shown because by the authors' method of selection of urban counties, an appreciable amount of rural business is necessarily classified as urban. If this could have by any means been transferred from the urban to the rural, it might have improved the ratios appreciably on the urban business.

The authors compare the proportions of deaths by different causes with the corresponding proportions derived from the 1927 United States Bureau of Census statistics adjusted to reflect the experience predominately on white males. The comparison is made in three age groups which of course eliminates the deaths under age 15 from the census figures. However, as the authors point out, it leaves in the deaths in the industrial population from which the insured population probably differs appreciably. One of the greatest difficulties in the comparison is trying to make allowance for the difference between the select period and the ultimate period. For instance, the proportion of 17.99% of deaths from "other accidents" for all ages combined during the select period is about twice as great as the census figure of 9.58%, whereas during the ultimate period the ratio of 10.39% is only slightly greater than the same census figure. Of course, the situation in the select period is due, not to the fact necessarily that the accidents have been high, but that many deaths due to degenerative diseases and some other deaths from diseases have been eliminated from the insurance statistics by medical and underwriting selection.

We do not lay much stress on the study of causes of death. Such studies as we do make are based on comparing our actual deaths with the expected by cause from the American Men Mortality Investigation. Death rates per 10,000 exposed to risk are given therein by cause by decennial age groups and distinguishing first year, second year, third to fifth year, and ultimate policy years. By the use of these approximate death rates we can obtain ratios of actual to expected deaths by cause with allow-

ance for the duration since selection and approximate allowance for the age. We have considered such ratios about as satisfactory as anything that could be obtained. Of course this experience is now somewhat out of date but it was based entirely on insured lives and furnishes the best basis for comparison we have had. A very rough comparison could similarly be made on the basis of the condensed analysis of causes of death given in the Joint Occupation Study, 1928, of the Actuarial Society of America.

While the mortality under Group Insurance has various characteristics different from that on Regular Insurance, our experience in the Southern states on Group Insurance may be of interest. For purposes of comparison the Southern states are taken to be the same as in the authors' paper, except that Texas is not included. It is interesting to note that Oklahoma Group mortality was very favorable, while the Union Central's Regular mortality was unfavorable. We have, however, included Oklahoma with the South.

The following table contrasts our experience in the South as defined with that in the rest of the country. The ratios given are the ratios between the ordinary ratios of actual to expected in the South and the corresponding ratios in the rest of the country. This is the method used by the authors to compare their Southern mortality with their standard, and thus eliminate as far as possible the inaccuracies of the mortality tables on which the expected deaths are calculated.

"THE SOUTH" EXCLUDING TEXAS AND TENNESSEE

	Exposure		Actual Claims		Ratio of Southern Experience to Rest of the Country	
	No.	*Amount*	*No.*	*Amount*	*No.%*	*Amt.%*
1913-26	120,192	121,640,897	887	888,969	114	106
1927	44,063	53,784,719	328	436,667	120	125
1928	49,913	65,513,675	436	556,607	129	121
1929	55,731	78,878,330	479	643,495	128	118
Total	269,899	319,817,621	2,130	2,525,738	121	116

The exposure in the rest of the country totaled to 7,028,054 by numbers and $7,981,045,000 by amounts, with actual deaths of 54,626 by numbers and $66,108,024 by amounts. One of the most peculiar features of this experience in the South is the higher ratios by numbers than by amounts. This is apparently a proof that the mortality among insured with small Group certificates is considerably greater in the South than is that in the case of those with large certificates. The latter class corresponds somewhat more closely to the insured under Regular policies. The mortality by numbers and amounts is practically identical in the case of the rest of the country. This table indicates a very real excess mortality in the South. For purposes of comparison with the experience under Regular business, the different class of the insured should be borne in mind, as well as the fact that disability claims are included with the death claims in the case of the Group Insurance experience, and especially that the disability claims have been very excessive in recent years in the South. The Southern business includes a certain proportion of negro lives but nowhere nearly sufficient to account for the excess mortality.

It is interesting to note the authors' observation that the picture of their Southern mortality changed appreciably from their investigation through 1925 to that through 1928. In our investigations I have been struck with the changes that occur as the experience matures. The exposure in the present investigation after excluding Texas, amounts to $918,484,000. Of course the average duration is comparatively small, amounting to perhaps seven or eight years with nearly two-thirds of the exposure in the select period. It wouldn't be surprising but that a corresponding picture, developed when the exposure on this same business is twice as great as the present, were appreciably changed.

The authors clearly show an excessive death rate in the Southern states, excluding Texas. An important point to be borne in mind is that even this experience is on lives that have been selected very carefully. If the corresponding experience

were available on the lives not insured, it is probable that the experience would have been considerably worse. In other words, the mortality lessons to be derived from this study are applicable in the future to carefully selected lives and not to types of prospective insurers that were not included in this study.

One point brought out in this paper occurs to me as justifying in a measure a modification of the opinion held by some to the effect that increased mortality in Southern States might be dependent upon poor examining service.

The statement that in the first two years of the select period the mortality was equivalent to that in other parts of the country, although it became less favorable during the next three or four years, would seem to indicate the value of medical selection here to be about as elsewhere, particularly in view of the marked increase of deaths from violence which appears to have occurred in the latter years of the select period and which would not be affected by medical selection.

A number of years ago my Company investigated its mortality by States, which investigation I reviewed in connection with the paper under discussion. It was on the American Experience Table, removed by time sufficiently, from present experience, so that comparison with Union Central Experience was not practicable. There was a very considerable difference, however, between certain Southern States, between which there can be no reason for anticipating a different character of medical service. Certain of the States showed practically as satisfactory a mortality as did Northern and Western States. I gained the impression that the character of agency selection was probably a quite important factor, more so in fact than any difference in climatic or health conditions.

A study by Causes of Death was not made, so that I was unable to determine the importance of violent deaths. It goes without saying, however, that Agency representation of character is highly necessary in a territory in which the insurance ideas of the insuring public may have a speculative tinge.

DR. CRAGIN—Gentlemen: Dr. Muhlberg is to be congratulated on his clear, logical, comprehensive, and thorough study of the southern mortality. Whereas the figures which we have are not so exhaustive nor do they analyze the situation so clearly, you will readily see by glancing at the accompanying chart that we largely corroborate Dr. Muhlberg's conclusions. In fact, you will see we have known since 1913 that our southern mortality has been considerably in excess of the mortality in the rest of the United States. Despite this fact we have continued underwriting and one state in particular we have underwritten at a loss all these years.

Our southern mortality was pointed out to me in 1925. Being a newcomer in the insurance field and having had no experience to work upon as to the best method of making a change in our practice, my point of approach was, therefore, somewhat different from that of Dr. Muhlberg. I felt that the true analysis of the situation could only be made at close quarters and after familiarizing myself with the territory I began to make extended trips into the field. My estimated mileage is about 25,000 miles. In this I covered not only the cities but the towns and backwoods, the river bottoms and the swamps, from the hills of eastern Tennessee to the plains of lower Texas. I met the agents, the doctors, and all the business men I had time for. My investigation I feel gave me a fairly comprehensive general view of conditions in each state, the conditions in the general agency, and the working conditions of the field agents. My conclusions were very definite and I can show you that we have obtained in a measure a reduction of our mortality. I feel that we have just started on this program and that another five years will show an even better mortality. At the risk of boring you I will attempt to explain to you how I made my investigation so that it will be possible for you to judge whether or not I was proceeding in a correct manner and to lay myself open to criticism on your part of the methods employed.

In the first place I went directly to my General Agent in the state under survey, laid the situation before him, showed him

his mortality figures, told him that I wanted to go through every part of his territory where he had ever gotten any business or ever expected to get any business, and that I wanted him to come along with me.

On reaching a town the first thing we did was to hunt out our doctors. Our method of procedure was somewhat as follows: If the doctor was in, we introduced ourselves, talked over local conditions; if he had any obscure cases or cases in which there had been quick deaths, these were discussed and he was shown as far as possible that the company was anxious to back him in his endeavors and to further his interests by giving him more examinations, but that the insurance business was a little different than the ordinary business of medicine. These points of difference were very carefully taken up and gone over at considerable length. In no cases did I fail of a most cordial reception. I met some very delightful men and found them all very anxious to learn and extremely interested in our figures. This goes absolutely without exception. Not once did I meet a man whose conduct in any way could be construed as antagonistic to the company or to the insurance proposition in general. While I was talking with the doctor I had a chance to look his office over. I looked his library over, the condition of his desk, the condition of his instruments, his medical bags, his dispensary, the furnishings of his office, personal appearance of the man himself, his conduct, and afterwards was able to note his location in the town, his standing in the community, and the type of person who patronized him. I made notes immediately on leaving the doctor's office as to what conditions were and these notes have proven most valuable since that time.

I found some doctors who were examining for our company who had retired from business and become bank presidents. Pointing out to these men the precarious position in which they were placed in examining applicants for insurance who owed money to their bank paved the way for a considerable number of resignations.

Some of the country doctors' offices were unspeakable and I give you this term advisedly. These men were cut off from our list.

It was interesting to note the hobbies of the doctors and allow them to run on at considerable length, all the time getting a line on their method of thought and knowledge of medicine and their command of the English language. I found that uric acid is still the bug-bear in some parts of the United States and that malaria and chronic rheumatism still cover a multitude of sins. It was most interesting to have the confidence of some of these physicians, to listen to their stories of attempts to improve themselves in the practice of medicine, to hear the older men candidly admit that times were changing and that they found it very hard to keep up with all the new things in medicine. The subject of blood pressure was always interesting and I carried around a little apparatus for checking blood pressure machines and checked a great many of them during my trips. In this way I have a personal acquaintance with a great many physicians and I always take particular pains in writing back on a case to call the doctor's attention to some little subject which was brought up during our conversation. This little personal touch has brought a remarkable reaction and I am glad to say that I feel that I can write to any of the men I met freely and frankly and get just as free and frank an answer in return.

As time went on I noticed a great change in the type of doctor's office throughout the South. There apparently has been a considerable awakening in the practice of medicine in the past five years. In repeating some of the territory that I started out on in 1925 the changes are surprising. Many a physician has built himself or rented for himself a little brick office building, usually one story, with a hospital attached. Practically all of them have some laboratory facilities. Their reading has been improved and here I may say that the man who sold a certain "Practice of Medicine" must have had a windfall, because I saw hundreds of these sets. Medicine is certainly improving in the South and we feel as an insurance company that we should do

everything we can to encourage a young man to settle in a town where there have been no first-class doctors for years and we like to appoint these men as our Examiners.

Just a word on how we get them: Contacts have been made with the medical schools of the South. Whenever I want a man for a certain locality I write to the Dean of the nearest medical school or the dean of the medical school from which the doctor recommended has graduated and ask him for a free expression of whether or not such and such a man would be a good Examiner for our Company. Our response has been most generous. It has enabled us to pick out in the larger cities, in the towns, and in the country districts men whose medical knowledge and integrity are far superior to anything we could find in that locality previously. I want to express publicly our deep indebtedness to the men who have been so kind to us.

By the time we have finished with the doctor we are ready to go on to the agent. The average agent is a true salesman and his idea seems to be to get the jump on the Medical Department with his first sentence. However puzzling this was to me at first, I am now prepared for it and we have no trouble at all in getting an immediate contact with the agent, finding out what his troubles are, explaining to him the nature of some of the declines, and explaining how he may conserve his time by writing only applicants on whom he thinks there is a fair chance to get insurance in the company and applicants who will pay him his renewal commissions for a considerable term of years. I have a great deal of assistance from the General Agents in sizing up the field men. I have a chance to note his general characteristics, his personality, the type of business which he solicits, and the type of man he can introduce us to in the town. Nothing is more pleasing than to meet an agent with a real grievance and straighten it out for him; and I may say also that nothing is more pleasing than to meet a field man with a fancied grievance and set him right. I like to leave the agent in a friendly mood. This is reflected in the future business that he turns into the company.

We then go to the town, city, or country through which we are passing. In the first place, we ride up and down the main thoroughfares, noting the absence or presence of water hydrants, sewage, the stores, and the character of goods which they sell. (A town which has its show windows full of nothing priced higher than $2.50—and I have seen just such towns—indicates that an industrial grade of people live in that town; and the converse is also true.) While we are going through the town, sometimes stopping to walk several blocks and go into a few stores, we have a chance to look the people over, to listen to their conversation, to note any characteristics of the section—just as one going into Detroit is immediately struck by the number of goitres in the women, they all wearing low-necked dresses so you can see the goitres.

We then go out into the residential districts, look over the homes, which gives an idea of the morale and the civic spirit of the town. If the houses are painted neatly, the lawns well kept, and the streets in good condition, we know there is a field for life insurance in that town.

We then talk with the business man, find out whether or not business is the steady type, whether it is farming or industrial or a combination of both, what the principal market is, whether or not the demand for the products of its factories and farms is intermittent or steady in type, the location of the town as regards a river or a swamp, the boll weevil, etc. I found some localities that had absolutely no civic spirit, no civic pride. Tuberculosis, pellagra, typhoid, typhus, malaria, and syphilis were prevalent and despite the earnest, honest efforts of the government of the United States to clean up these corners, there was no cooperation from the people and we decided with the full consent of the General Agent that no insurance would be written in these localities. I have in mind one town of 1,600 people that has six doctors, no one of which was a medical graduate from a recognized school. We are not doing business in that town and we will not do business there until the town sees

fit to demand and receive the services of a doctor whose education is at least comparable to that of other towns of the same size.

We have also made it a point in our trips over the southern territory to get acquainted as much as possible with the medical directors of the insurance companies who are doing business in the southern states, particularly those who do an exclusive business in the southern states. Here again I have met with the most gracious reception and have made some friendships which I am glad to acknowledge at this time and to express my indebtedness to them for the many helpful hints which they have thrown out and their cooperation.

After making a rather careful study and concentrating myself intensively on one or two states, it seemed necessary to restrict the territory in which we were writing business. We made a very drastic cut in one state in which our mortality had run exceedingly high. This was done in an experimental way and purely on account of the fact that we never had written business in this state at a profit. We felt practically most anything would be better than carrying on as we had been. We met with considerable sales resistance to this but the scheme went through and we began to make some progress in our underwriting in that section. We have gradually added on a few towns but until the mortality is better than it is now we probably shall not make any further change for some time.

A curious sidelight on this action was that there was a large lapse rate in the territory which we restricted and our General Agent came in with, what to him, was the startling statement that practically all his deaths now—his first and second year deaths—were occurring in territory which was not restricted. I told him that if we had good luck this would continue until there were no deaths in the restricted territory and all deaths would be in the unrestricted.

You will see by the figures which I present here that in the past five years our average mortality has dropped. The comparisons can be easily made from the charts.

I am perfectly aware that this is not a classic discussion but it has some common sense facts which are not hard to get. Whether or not it would pay all companies to make similar investigations will have to be left up to the Departmental heads. We do feel that it has more than paid our company. Criticism may be properly directed that I am the only one who can underwrite this part of the United States in our office. That was very largely true but we have a few rules now in our underwriting which enables me when I am away on my trips to let any one of my associates handle the business without any fear of getting into trouble. There are a few field men and a few of the doctors that we have to watch in this part of the country but I am candidly of the opinion that there are not any more here than there are in any other part of the country.

It is certainly a sense of satisfaction when one is sitting at his desk reviewing applications to be able to recognize the Examiner, visualize him in his surroundings, the territory in which he works, and the trade conditions. Whereas I do not subscribe to a great many of the newspapers in the South, yet through the general news I am able to keep in touch with a great many health situations which arise, to know the trade conditions, and to have a general working idea of what to expect in various parts of this southern territory.

I want to particularly comment on the statement made by Dr. Muhlberg on the actual increase of suicides in the South. We know this to be so. Just why it is so I am not prepared to state definitely but I have my own ideas on this subject.

On the whole I think that the time spent in investigating the South has been worthwhile from all standpoints and so long as our mortality continues to drop from year to year I shall continue to keep close check on what is going on in this territory.

TABLE 1

MORTALITY IN THE SOUTH

1900-1916 (Traced to 1917)
Medico-Actuarial Table

	Numbers	*Amounts*
Georgia	115.6%	141.4%
Lower Tier	88.8%	121.7%

1885-1913 (Traced to 1914)
Medico-Actuarial Table
AMOUNTS ONLY

	First Year	*All Years*
Georgia	115.8	134.6
Lower Tier	118.1	115.9

TABLE 2

GEORGIA MORTALITY BY YEARS

	NUMBERS		AMOUNTS	
	Amer. Exp.	*A.M. Ult.*	*Amer. Exp.*	*A.M. Ult.*
1920	68.1	83.6	59.3	71.9
1921	82.5	99.2	91.4	108.7
1922	93.1	112.6	89.6	107.4
1923	75.9	93.4	71.9	86.3
1924	108.0	130.5	118.2	141.6
1925	66.3	80.2	63.4	75.9
1926	64.9	79.4	58.9	71.0
1927	63.4	76.7	67.6	81.3
1928	73.0	87.6	69.0	82.3
1929	82.3	97.9	93.8	111.6
Average first 5 years (1920-24 incl.)	85.5	103.8	86.1	103.1
Average second 5 years (1925-29 incl.)	69.9	84.2	70.5	84.3
Average: Ten years (1920-29 incl.)	77.0	93.2	77.7	93.1

TABLE 3

LOWER TIER BY YEARS

	NUMBERS		AMOUNTS	
	Amer. Exp.	*A.M. Ult.*	*Amer. Exp.*	*A.M. Ult.*
1920	60.5	80.6	61.1	81.1
1921	68.6	90.0	77.3	100.2
1922	65.5	86.6	83.6	109.8
1923	53.9	72.8	51.7	68.1
1924	72.4	97.2	81.7	106.8
1925	52.0	70.7	64.4	64.1
1926	49.9	68.7	55.7	72.7
1927	51.4	68.1	56.9	73.1
1928	54.9	72.1	68.0	86.5
1929	58.5	76.3	64.1	80.7
Average first 5 years (1920-24 incl.)	64.2	85.4	71.0	93.2
Average second 5 years (1925-29 incl.)	53.3	71.1	61.8	75.4
Average: Ten years (1920-29 incl.)	57.5	76.6	65.1	84.2

RATIO ACTUAL TO EXPECTED
American Experience Table
AMOUNTS
Experience during calendar years 1920-1929 on all years of issue.

	Aetna	*Union Central*
Alabama	65.6	55.609
Arkansas	64.0	64.371
Florida	14.9	48.790
Georgia	77.7	62.183
Louisiana	65.4	56.604
Mississippi	73.5	58.750
North Carolina	72.8	37.753
Oklahoma	62.7	93.039
South Carolina	87.7	52.001
Texas	60.0	44.214
Total Southern States	66.1	55.092
Total Company Excluding Above Southern States	61.3	45.024

The conclusion is that our mortality is approximately 10% higher in the South than elsewhere.

The above table represents a comparison with the tables of the Union Central published in Dr. Muhlberg's paper. Note, however, that the years do not exactly correspond but it is the nearest comparison we can make.

In the years of issue 1900-1916, traced to 1917, the lower tier of southern states was:

Georgia
South Carolina
Arkansas
Oklahoma
Alabama
Texas

In the years of issue 1885-1913, traced to 1914, the lower tier of southern states was:

South Carolina
Oklahoma
Texas
New Mexico
Georgia
Northern Alabama

For the years 1914-1920 we have no figures. They have disappeared somewhere. In the year 1920 the lower tier of southern states was:

Georgia
South Carolina
Arkansas
Oklahoma
Alabama
Texas
Arizona
New Mexico
Mississippi
Louisiana
Florida

They were the same for 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929, and 1930.

Dr. Righter—It is probably true that during times of stress or of unusual experiences one is apt to be critical to the point of unfairness. Yet with that thought in mind there can not help but be developed firm convictions based upon observations and impressions. In the search for truth one should not be criticized too severely for expressing opinions which may not as yet be possible of proof.

The authors of this timely and excellent paper on Southern Mortality ask some questions and imply others. Perhaps my comments may carry those thoughts just a little deeper.

The Company I represent has done an almost exclusive southern business from the time of its organization until recently. During the years 1923 to 1929, inclusive, the gross death claims amounted to $6,688,547. The following facts as to distribution by cause of death and the percentage of the whole may be of slight interest. Having made no mortality study, accurate data can not be given.

Cause of Death	*Amount*	*Percentage*
Tuberculosis of the Lungs	284,599	4.25%
Cancer	375,968	5.62
General Diseases	1,017,999	15.22
Cerebral Hemorrhage	511,853	7.65
Disease of Nervous System	761,459	11.38
Organic Disease of Heart	326,448	4.88
Angina Pectoris	536,400	8.02
Disease of the Circulatory System	1,528,923	22.85
Pneumonia	446,749	6.68
Diseases of the Respiratory System	553,734	8.28
Appendicitis	123,121	1.84
Diseases of the Digestive System	345,641	5.17
Nephritis and Bright's Disease	304,716	4.55
Non-Venereal Diseases of the Genito-Urinary System	325,740	4.87
Suicide	635,239	9.49
Homicide	116,219	1.73
Affections produced by External Causes	1,694,577	25.34
Ill Defined Diseases	392,825	5.9

For the sake of brevity certain statements are made, perhaps a little dogmatically, but they are personal convictions as to the probable causes of the extra mortality in certain parts of the South and apply especially to rural sections.

To be beaten by the forces of nature and economic manipulations for three years out of every five and to have the worries of financial difficulties ever present is not the best basis upon which to build good health of mind and body, nor to ward off a tendency to die. Debt and its worries kill. Anti-selection must be present and a positive influence.

There seems to be, and perhaps actually is, an unusually high percentage of poorly trained, indifferent to responsibility, medical men in the rural sections. Admitting without question that a marked change has taken place in the past and that the situation is steadily improving by the addition of better trained men from the medical schools now in existence, yet there is room for much improvement.

If a man from one section of the country visited another section and reported on conditions he found to exist, is it not likely that, according to his own plane of existence, he would report that which was the most obvious departure from his stand-

ards? If an actual moral hazard exists in a community through ever present financial difficulties and certain standards of personal habits, all of which may not be given a proper relative value, could a resident of such a community catch the true significance of some things that he may be called upon to value in a commercial inspection report? I think not.

Despite the vote on prohibition, as shown in the Literary Digest poll on the subject, and the existence of prohibition in some form long before the eighteenth amendment, the South is and has been definitely wet. The free use of unaged corn whisky is common and in my judgment a serious factor in the excessive mortality shown in all investigations. Saturday afternoon and evening over-indulgence is still a matter of personal privilege.

To digress for a moment, I am thinking that the institution of life insurance asks only two things of an applicant—the first is to tell the truth and the second is to pay the premiums when due. The judgment of any given set of facts is worthless unless those facts be truthful. Honesty is not sectional, but sometimes I wonder what general influence, financial difficulties, self-indulgence, etc, have on character building.

The South is a section of strong prejudice, firm conviction, and frequently inclined to be explosive in the expression of opinion. Whether it be the influence of long months of warm weather and a peculiar freedom with respect to working or going fishing I don't know, but there are elements of this sort which are not conducive to orderly, balanced living and one must look to the question of temperament and general living habits in the search for the cause of too frequent deaths. Indulgence in one's pet vices is not always helpful or influential in general character building.

Again and again I have been impressed with the frequency of purple edged gums in the mouths of the rural resident of the South. Pronounced infection seems abnormally frequent.

Hypertension between 150 and 200 is so common in otherwise healthy looking active farmers as to be impressive. Unfortunately many of these are not so reported to us.

An unbalanced diet with a high percentage of fats from the use of corn bread, pork, and the general love of gravy is easily observed in even a casual visit to rural communities. For long months of warm weather such a diet is not indicated and would be adequate for polar regions. Witness the prevalence of pellagra in the proof of this point of unbalanced diet.

Low grade gall bladder infection must be common with such a diet and the prevalence of typhoid, hookworm and malaria. I'll admit that these cases do not seem to terminate in undue numbers of operative interference. I judge the influence to be slowly degenerative rather than to show as acute attacks. All "Bilious Attacks" are not malaria per se.

Bass, in Cecil's Practice of Medicine, says of malaria, "In southern states where it is still common, the severity, incidence and extent of the disease had been decreasing, but during 1928 and especially during 1929 it has equally rapidly increased".

More or less frequent mild attacks of malaria, with the resulting permanent changes in spleen, liver, and kidneys, can not do other than promote general degenerative changes even though the patient apparently recovers rapidly and such changes can not be readily recognized.

Dr. Alton—May I make a few remarks on your paper on mortality in southern states. When Dr. Cragin was speaking, a good many thoughts came back to me about the South. You may be a little surprised at my appearance of youth, but my first observation goes back to '77 when I went for my company down to Savannah to discover the effects, if possible, or the causes of yellow fever. Again I went to Memphis in about 1879 or 1880 to study conditions there. Then I took up the state of Tennessee, because Meech's old tables—know nothing of them; they go back to the last century—showed Tennessee with a mortality of 123, I think it was. I wish Dr. Cragin had let me know he was going South and I would have given him my report, made a good many years ago, to be sure, but it dealt with the geography, the geology, the agriculture and the climatology

and the present condition of health in Tennessee. That, I think, is quite as favorable as states south of it.

Now Birmingham has been alluded to as a likely city for insurance, and also Atlanta, New Orleans and so forth. In all of those places you can get first rate medical examiners. There is no question about it at all. And the mortality I don't think is to be doubted. However, you know agents perhaps as well as I do. You would have to put a stone wall around each of those cities to prevent their going out into the country to select risks there that are of an entirely different class than those in the large cities.

We speak of Birmingham, Alabama. I have been there and I have looked over Alabama very closely. Two or three times I have made reports to my company on Alabama, Tennessee, Georgia, etc. I even went to graveyards, cemeteries. I walked down aisle after aisle to see the ages recorded on the tombstones. You would be surprised how few I found even entering the 70's. For comparison I went into an old graveyard up in a town in New Hampshire and there my surprise was quite different to find a large number in the 80's and 90's and even a few in the 100's. Now there is a little point—and just let me say that if any of you are contemplating entering the southern states for business, take a survey, as Dr. Cragin has and as I did many years ago. Then go up into Minnesota, or Michigan, or some places in New England and make your extreme comparisons.

Another thing, for thirty or forty years I have been studying the annual health report of the State of Michigan, we will say. There is a registration law in that state. Then go on to Alabama. In '26, I think it was, the Legislature passed a bill requiring registration of births, marriages and deaths. We have had it here fifty years or more. You will find that the printing of their first annual report has not yet appeared. There have been partial reports, reports from some of the towns and some of the counties, but from a great many of them there have not been any reports. The federal government got out its health

census and gave us so many figures that seemed to be accurate, but I know that the gathering of statistics in the South has only been partially done.

DR. MUHLBERG—I think we Medical Directors know that the southern mortality, particularly in some southern states, is considerably higher than the mortality in the northern states, and what I was particularly interested in was in knowing why. We had all theorized, of course, feeling that the prevalence of malaria, hookworm, pellagra, alcoholism, syphilis, poor examiners and violent deaths had something to do with raising the mortality in the southern states.

Now we all know that while malaria is very prevalent in certain sections of the South, it is nevertheless a fact that our death claim papers rarely indicate that malaria is a direct cause of death, but there can be no question that malaria is very frequently an indirect cause of death in that it lowers the vitality and predisposes the individual to the ravages of other diseases. It is ordinarily stated that malaria predisposes particularly to deaths from pneumonia, hepatitis and nephritis, and in analyzing the causes of death as shown by Mr. Koeppe's investigation, we found that our deaths from pneumonia in the South were slightly higher than the deaths from pneumonia in the northern states but that increase was not sufficient to account for all of the excess mortality.

On the other hand I was rather surprised to find that the deaths from nephritis were actually lower than the deaths from nephritis in the northern states and, furthermore, that the deaths from hepatitis or liver disease in the South were really lower than in our northern experience. There has always been a suspicion that there has been perhaps more drinking in the South than in the North. If that is so, you would expect an excessive death rate due to cirrhosis of the liver. Our investigation doesn't indicate that there are more deaths from cirrhosis of the liver in the South than in the North. I also had a suspicion, as most Medical Directors have, that perhaps syphilis was perhaps more

prevalent down South than up North. If that is so, you would expect a larger percentage of losses from locomotor ataxia and paresis. Yet the deaths from those causes down South were a little bit lower than those in the northern states. Possibly that may be due to the malaria infection, because we know that malaria does protect syphilitic individuals against paresis and locomotor ataxia.

We have all known, of course, that the violent deaths, particularly homicides, were more numerous in Oklahoma and in Texas than they were in the northern states. It was somewhat of a surprise to me, at least, to find that the violent deaths were quite as prominent a feature among the causes of death in the other southern states as they were in Oklahoma and Texas, although I believe Oklahoma leads the list.

So far as the examiners are concerned, I think that is one of the dominant factors, but you will note from my investigation that the mortality in the large cities is also excessive, in spite of the fact that we have splendid examiners in the big towns. We have very good examiners in Atlanta, Birmingham, New Orleans and other places. These doctors are hand picked, are graduates of the very best schools and, for the most part, are my personal friends and I know they give me the facts. I don't believe we get any better examinations anywhere in the country than we do in Atlanta, Birmingham and New Orleans, and yet the mortality in those cities is not as good as in the northern cities.

As Mr. Koeppe has stated, the excess mortality down South can be accounted for largely by the violent deaths, homicide, suicide and deaths from other accidents, and I am really very grateful to Dr. Righter for the statement, for the courageous statement, that he made because I think he has given us a true picture of the conditions down South. I really believe that he has come nearer to guessing why the mortality down South is excessive than any statement I have ever heretofore heard.

There is one rather interesting feature about the South, developed through the studies of Dr. Mills of the University of Cincinnati, which he will publish shortly in the Archives of In-

ternal Medicine. Dr. Mills is studying the mortality of all southern countries compared with the northern countries—comparing the mortality of southern Europe with northern Europe; southern United States with northern United States; southern Asia with northern Asia—and he finds, so far as his studies have gone—he has so far investigated only diabetes, pernicious anemia, exophthalmic goitre and, I believe, heart disease—that as a rule the mortality from degenerative diseases is lower in the southern climates than in the northern climates. His own theory is that the persons who live in the warmer climates expend less energy, they don't worry so much about business conditions, they are not compelled to pursue the same rapid pace that we are compelled to pursue in the northern countries, the economic pressure is not quite so great and the standard of living is not quite so high. When a European comes to New York City he frequently observes there is something about New York that peps him up, puts him on his toes and he works harder. I believe this study is going to be very interesting, and if that is true, really outside of malaria and conditions such as Dr. Righter has expressed, the mortality down South ought to be better than up North. I believe they lead easier lives, more comfortable lives, down South than they do in the North, but unfortunately, of course, the mortality experience down South, we can't overlook the fact, is an unfavorable one.

Perhaps Mr. Koeppe would want to say a few words on the actuarial phases particaularly discussed by Dr. Grosvenor. I am not really competent to enter into an actuarial discussion of the question.

MR. KOEPPE—I just want to make one or two remarks. The figures representing the general mortality of the Company with which we compared the figures of the southern mortality covered exactly the same years of issue and also the same years of exposure. We were very careful to use, in fact, not only the same years but also the same method in obtaining these figures. We formed our ratios in order to determine the excess of the

southern mortality over the Company's mortality, excluding the South, by using the American Experience figures, but we found that if we had used the American Men table, the results would have been practically the same. After we had our figures together, we also felt that it would have been better if we had excluded Texas or parts of Texas, but unfortunately it would have delayed the paper so long that we couldn't do it.

DR. MUHLBERG—It pays occasionally to see ourselves as others see us. In our zeal to educate the examiner in the field, we have not always given him the opportunity to express his views or to offer valuable suggestions. The subject of "The Attitude of Medical Examiners Towards Insurance Companies" is a delicate one to handle, but Dr. Old has treated it with splendid tact and fine judgment.—Dr. Old.

ATTITUDE OF MEDICAL EXAMINERS TOWARDS INSURANCE COMPANIES

HERBERT OLD, M. D., ASS'T. MEDICAL DIRECTOR,
The Provident Mutual Life Insurance Co. of Philadelphia, Pa.

With the kind and hearty cooperation of the medical directors of twelve companies, I was able to send the questionnaire to 268 examiners. These were well scattered throughout the various states, and probably make a good majority of the examinations for their respective companies.

There were received 220 (82%) responses, which demonstrates a keen interest in the subject. Many expressed their appreciation of having been afforded an opportunity to state their views. They were free and frank in their statements, and showed a constructive rather than a critical spirit.

They demonstrate very clearly that the medical profession is imbued deeply with ethical principals, and are conscious and proud of the fact that their work is an art, not a trade; a calling, not a business.

Their main problems are our problems, namely, business versus professional values, and it requires long training and vast experience to learn a somewhat safe and workable middle ground. One of them expressed the problem very succinctly and completely: "You cannot serve two masters".

For convenience of enumeration, I have generalized the answers under various headings which seemed to include the points in common and those which they emphasized. I have, further, quoted from different questionnaires some answers that applied to the question, as this is a paper on their views and not on mine. Such an enumeration cannot begin to do justice to the numerous admirable dissertations and suggestions that were received. However, I think we can obtain a clear idea of how the examiners, scattered over

a large section of our country, react to the rules and regulations of the various Insurance Companies, and bear our problems in the field.

The following letter was mailed with each questionnaire: "Dear Doctor:

"I have been requested to contemplate the preparation of a paper dealing with the relations of the examiner in the field to the Medical Department.

"In order to obtain the viewpoint of the examiner, the Medical Directors of ten companies have kindly sent me a list of twenty-five of their most reliable examiners. It is needless to state that you are one of these, and we would appreciate an early and explanatory reply to the questionnaire. The individual answers will be treated confidentially and your status as an examiner will in no way be affected by what you have to say."

THE QUESTIONNAIRE

1. Do you think that the questions on the medical blanks are sufficiently leading and complete:

   (a) To bring out the past and present personal history of the applicant with regard to subjective symptoms and any past illnesses?

   (b) To be able to elicit the important signs and symptoms of beginning cardio-vascular changes, tuberculosis, psychosis, syphilis, cancer, and gastro-intestinal disturbances?

(a) "Yes"—unmodified—93
"Yes, some blanks"—4
"Yes, if applicant is honest and sufficiently intelligent"—9
"Yes, if questions are arranged or asked to bring out symptoms and descriptions of illnesses, present and past, rather than mentioning the 'diseases' or symptoms"—37

"The questions are on the whole very satisfactory in bringing out past illnesses. I find a good question is, 'Have you ever been x-rayed?', 'Have you ever had an attack of acute or chronic appendicitis?'. A little patience and care, I believe, brings out the significant things, regardless of the questions on the blank."

"Yes, in the hands of a capable, interested, and conscientious examiner. Whether a blank could be devised that would serve acceptably as a substitute for intelligent inquiry and examination is open to question."

"Yes, in the hands of the careful examiner, and no amount of elaboration would help the careless examination."

"No, the past illnesses are well covered, but I find that questions in regard to subjective symptoms are either absent or poorly treated."

"Yes, but many examiners do not question sufficiently. They confine themselves entirely to the questions as asked and not to the possible ramifications."

"No, symptoms such as fatigue, shortness of breath, swelling of ankles or feet, pain, etc., are more easily understood by the average applicant rather than the enumeration of organs and diseases of them."

"Yes, but is dependent upon the examiner. No blank will protect the interests of all concerned, where the examiner is careless, mechanical, or in too great a hurry to get them."

"No, especially pertaining to venereal disease. Most blanks are not specific enough in regard to this disease, nor do most blanks call for as complete a neurological examination as they should."

"Yes, in general. Yet I think the previous history should delve more into: 1. Previous athletic efforts, 2. Previous war record regarding wounds, gas, hospitalization, and government disability. It has been my personal experience to note that during the past

25 years many of my athletic friends are dead in early life, and this is so all over the country. This occurs particularly in those chaps who in their early formative period indulged in (1) Four mile crew races (2) One-half to four mile running races (3) Four lettered sport men (4) All round athletics. They generally succumb to: 1. Cardiac compensative exhaustion. 2. Pulmonary tuberculosis. 3. Angina pectoris. 4. No resistance to acute infections (in other words, burnt out early). Of a list of 30 such individuals, 16 died of T. B., 3 of pneumonia, 8 of heart, 3 of appendicitis, typhoid fever, influenza. Evidently a continuous strain upon the heart, lungs, and circulation, for every season through four years, and then the athletic oblivion for the rest of their days which is the unfortunate price for business effort and success, were the causes of general lowered resistance."

"Yes, dependent upon the intelligence, experience, and tact of the examiner in asking the questions slowly enough so as to expect a thoughtful answer and to be able to detect evasions and follow out the leads" —67

"No"—unmodified—10

"No, most of the blanks are too detailed at present. The examiner spends five dollars worth of his time seeking to have all of the questions answered, and precious little time examining the applicant. Make the questions fewer and more general and allow more space for description. Give the examiner a chance to give the Company his best as a doctor and not as a clerk."

"With a few exceptions the blanks are antiquated and exhaustive but not comprehensive of many of the latest advances in medical science. They have not been reconstructed to keep pace with the manifold provisions and benefits of modern life insurance policies."

(b) "Yes"—unmodified—63
"Yes, honesty of applicant"—6
"Yes, dependent upon examiner"—85
"Questions rearranged" (see (a) under 'Yes')—30
"No"—unmodified—36
"No, many of the questions are stereotyped and traditional. They do not elicit necessary information, or signs and symptoms, leading to the detection of 'beginning changes' unless the examiner goes beyond the scope of the blank using it merely as a framework."
"No, beginning changes are largely subjective and often not in the individual's awareness or consciousness. To elicit these requires very careful and patient questioning, frank and non-evasive answers, and an interested and observant doctor. There follows an examination of a willing applicant, under conditions controllable by the doctor, as free disrobing, quiet, and as much time as he deems necessary. Finally, there is the help that can be obtained by the Wassermann, the x-ray, and the electrocardiograph. It is obvious that none of these conditions are fulfilled with any degree of competency in the usual examination. The applicant may be honest with his intent and yet not absolutely frank. The average applicant for insurance, whatever his standing in the community, will often accept any evasion that is made easy for him. Questions must 'hit' him in such a manner that evasion seems more like a perversion of the truth."
"Cardio-vascular: History of acute infections as rheumatism, chorea, tonsilitis; history of dyspnoea or edema of ankles; has any doctor ever said you had a heart murmur. Tuberculosis: History of nervous breakdown, fatigue, pleurisy, frequent and somewhat prolonged coughs, exposure by contacts, history of x-ray, any loss of weight. Examinations of chest are very disappointing in discovering early T. B.

Syphilis: Get history of chancre or Wassermann test, or of treatment.

Gastro-intestinal: History of any x-ray taken, prolonged dietary, periodic pain, loss of weight, beginning or progressing constipation."

"No, this would require something of a diagnostic survey at a cost of about twenty times the average fee for examination."

"No, recently two cases of cancer of colon occurred one year after examination for insurance. In both instances early symptom was obstipation, not covered by questionnaire. I feel sure that syphilis and tuberculosis are usually denied by a large number of applicants who have been so affected. As to psychoses and gastro-intestinal history, care should be taken to communicate with former medical attendants."

"Questions regarding shortness of breath or precordial pain on exertion or after a hearty meal may bring out the question of old coronary disease."

"Yes, if carried out conscientiously by the examiner. Weakness of the present system is inherent, I believe, in two fundamental features: 1. The applicant wishes to make the most favorable impression possible and will not volunteer any clues—may even suppress them when questioned directly. 2. The examiner is unwilling or reluctant to find impairments and will do so only when they are pretty obvious."

"No, in order to discern these it is essential in suspicious cases to have Wassermanns' x-rays, and cardiogram readings."

"No—'How tired do you find yourself at night after a fairly strenuous day, and how long does it take you to become rested?', would throw some light upon beginning cardio-vascular changes. An examiner clever enough to spot beginning cancer or syphilitic changes is too clever to be doing insurance examinations in the necessarily limited time allowed."

2. Do you think that the ordinary medical blank and the required examination for life insurance is sufficiently complete so as to cause you to be able to recommend the applicant for the total disability benefits to be added to the policy?

"Yes"—unmodified—95

"Yes, honesty of applicant"—6

"Yes, dependent upon examiner"—46

"Questions rearranged"—12

"No"—32

"Dubious"—25

"Don't know"—4

"Medical history is most important and has great bearing in the recommendation for total disability. Space should be provided on the blank to record impairments, deformities, and abnormalities."

"Question should be asked on blank or the voucher whether applicant is a desirable risk for Health and Accident Insurance."

"No, the high pressure methods now employed for getting business, and getting the applicant examined as soon and as quickly as possible may be good from a mortality standpoint as long as the medical examination 'on paper' is correct and the margin of safety sufficiently large, but to issue 'total disability benefits' upon an examination made under many unfavorable conditions, notably place, hurry, noise, which precludes a careful health examination, is to say the least, not a safe or reasonable procedure. It should be a health examination in its truest sense, and such requires a much more comprehensive questionnaire regarding past illnesses than is found on the ordinary blank. The applicant should be examined at the doctor's office, and the resistance of the doctor as opposed to the resistance of the agency force should have the upper hand."

"Dubious—a more careful examination and a full coverage of all symptoms, diagnosis, time disabled, treatment, after effects, and recurrences of all diseases in the past ten years would be a great help in the selection of applicants for disability insurance."

"Yes, the elusive factor here is the honesty of the applicant."

"No, the blank may be sufficient, but I am not familiar enough with the requirements of the chief examiner to be able to decide."

"Following the law of average—yes. Perhaps the day will come when electrocardiogram and basal metabolism will be included as a routine."

"No, questions do not bring out the disability element of medical history."

"No, blanks do not include enough tests for nervous and mental conditions. Personally I think a separate blank, with a good deal more detailed personal and family history, would be advisable for disability blanks."

"No, it seems to me too little attention is paid to the way a man lives; habits, etc."

"As far as the purely physical part of the examination is concerned, I would say 'Yes', but when it comes to estimating the mental state or attitude of the applicant, I do not know. Many who appear to be excellent risks at the time of examination have very odd reactions in the face of slight disabilities."

"No, specific information and inspection of the eye grounds and ear drums is not asked for. Inspection of the feet for broken arches (definite relationship to varicosities) is not demanded. I know many splendid competent examiners, but very few who appreciate what disability selection means. This involves not only life expectancy, but will he react normally to prosperity or adversity, and remain well. To decide such requires a careful and thorough ex-

amination, and the obtaining of an intelligent family history regarding nervous and mental diseases, alcoholism, suicides, and epilepsy; also, a knowledge of his habits regarding eating, drinking, exercise, recreation, and health examinations. These important factors are not usually brought out by the ordinary examination for life insurance."

3. Do you think it advisable to have the medical examination sent directly to the Home Office and not permitted to go through the Agency?

"Yes"—unmodified—134

"Yes, if concerted action is taken"—1

"Yes, except in large agencies where General Agent or Manager protects the confidential nature of the report and the examiner"—16

"It should be sent to the Home Office. The abuses of any other system are too numerous to mention. The expense of time in obtaining corrections or omissions on incompleted blanks would be inconsiderable as compared with the value of unmodified reports reaching the Home Office. I do not infer dishonesty or questionable tactics, but recognize the instinctive habits one would have in expressing himself without any modifying influences."

"The Agency never likes to have a rejection on record. If you want complete medical reports of rejects you had better cut out the Agency censorship and mail reports direct. Even then a reject seems to make the doctor obnoxious in the eyes of the Agent."

"Home Office, although examiners should always remember that the Agent has a considerable interest in the outcome of the examination. He should be willing and able to furnish Agent with a reasonable amount of the information it contains."

"No"—unmodified—11

"No, saves omissions"—17

"No, local file is of benefit for subsequent examinations"—2

"No, Agent is a co-partner, but voucher is necessary"—17

"Not particularly"—20

"Not practicable"—2

"I believe it helps the business if the medical examination goes through the hands of the General Agent, not the individual agent. Clerical errors can be picked up, completed examinations put together, and extra procedures, if indicated, can be started. A knowledge of the general medical aspect of a case is a help in dealing with the applicant."

"This is difficult to answer. I can now foresee how troublesome it would be to the examiner, for we all know the restlessness of the soliciting agent until he learns whether the examiner has recommended the applicant or not. Then, too, omissions of answers to questions are not infrequent and I can see the unnecessary delay this would cause."

"I believe that the examinations should be sent directly to the Home Office and that the report should be more or less confidential. This, of course, is a big question. I have a personal and definite idea that the physical findings you have of any man are confidential, whether given to an insurance examiner or his private physician. These findings, if given publicity, may leak out to his fellow employees, which may do him harm as regards his position or standing. Again, many men are very sensitive regarding impairments. I may be a little old fashioned in this way, but I believe the confidence should be kept."

"By all means—when the agency receives the examinations, some of the apparent rejections do not get to the Home Office. The Agent also has the opportunity of reviewing the blanks and he can tell the careful examiner from the careless one. In other

words, he wants business and can easily select the weakest doctor on his staff."

"Yes, I believe the applicant would appreciate this, as they do not like the Agent to know some of the information in the examination."

"Insurance Agents are quite curious, and usually well versed in medical nomenclature. Sending the examination direct to the Home Office doesn't remove the fact that after all the Agent is a co-partner in the issue or rejection of a policy. Pseudo-secrecy does not remove the obstacle in the end to be obtained. I personally favor the indirect route so that the Agency can be given all the pertinent facts. Honesty, after all, is the best policy."

"Yes, I examine for five companies and find that there is much less trouble with the field staff and less criticism in border-line cases when they go directly to the Medical Department."

"I certainly do. It would save much embarrassment and a lot of explanation of things that strictly speaking are given in confidence by the applicant."

"Yes, many agents will suppress any report containing a variation from the normal."

"Yes, I know of instances where things have been changed on the blank, and there are too many chances of the Agent influencing the so-called weak examiner."

"Most emphatically yes. It is a good deal of a bore when the Agent calls for the medical, seats himself comfortably, lights a cigarette, and proceeds to comment interestedly and at length on the albuminuria, the hypertension, or on whatever impairment meets his gaze. I feel that the medical report belongs to the Company and the Agent should not see it."

"Advantages both ways. A detachable voucher to be sent to the Home Office allows one a chance to put on some things the examiner might not like to dis-

close to the Agent. The full blank, with the voucher detached, left with the General Agent is very satisfactory."

4. Do you have much difficulty in obtaining sufficient control of the appointment for examination, or of the applicant, so as to make as careful and complete an examination as you deem necessary?

"No"—unmodified—81
"Rarely"—21
"No, if General Agent or Manager backs up the doctor —11
"With applicants 'No'—with Agents 'Yes' "—5
"No, if appointment outside of office is made or corroborated by doctor and applicant"—11
"Won't go outside of office to make an examination" —5
"Yes, in some cases"—41
"Often"—12
"With women applicants"—2
"Yes, with appointments, usually outside, made by the Agency or brokers"—23
"Yes, office visits the only satisfactory ones"—8
"No. It is only in rare instances that I will consent to examine an applicant outside of my office or the office of the Company (Agency), or that of another physician. It is most unsatisfactory, in my judgment, to examine a man in his own office and this is particularly true as it bears upon your Question 5."
"I would like to recommend that no examiner be allowed to examine an applicant in a noisy factory, or even the office of such a plant. For obvious reasons absolute quiet is necessary and it seems to me that the only places are in the office of the local insurance company, the examiner's office, or possibly the applicant's residence. Then too, overweights will always minimize their avoirdupois."

"Yes. It is frequently necessary to make an examination in places which are unfit for that purpose—cloak rooms, toilets, factories where machines are running, public offices, etc. Then it becomes essential to do the work all over again or else make an appointment to examine the applicant in more suitable quarters and surroundings. This is an obstacle which is hard to control or overcome in large cities."

"Yes, on occasions. It depends on the type of Agent. The most satisfactory examination is made on an applicant that is sold sufficiently so he will come to the physician's office."

"Not often. Examiner can intimate that possibly an impairment is present which should be studied more carefully. An applicant readily responds favorably to this because he is getting a good examination for nothing, and all men are interested in learning of any impairment."

"75% of my examinations are made outside of my office. 80% of the applicants could come to the office."

"The doctor should be given a leeway of 1 to 2 hours for outside examinations."

"Some Managers think they know more than the examiner about the fitness of insurability."

"It is correct to say that the examiner has no control whatever over time or place for examinations. Not infrequently the surroundings are unsatisfactory, but it is utterly impracticable to refuse proceeding with the examination except in extreme cases. From my own observation I can state that many applicants prefer visiting the doctor's office, if they are given an opportunity to do so. As a rule the Agents believe the resistance is minimized by arranging for examinations in the applicant's office. In my opinion, a large number of examinations could be made at companies' or doctor's offices without prejudicing sales,

if the Home Office authorities of all companies indicated their wishes clearly."

"Practically no problem at all. I believe 90% of my examinations are done at applicant's home or my office. Very occasionally examinations have to be made at business places where it is impossible to make a proper examination. Applicants are willing to come to office or home if problem is explained properly."

"Yes, the Agent's attitude toward the careful examiner is not as cordial as it should be. They nearly always prefer a careless examiner. There should be some way of checking this attitude."

"Yes, hurried appointments to examine applicants at place of business or residence is quite a common practice. Frequently the applicant is told that examination should only take ten minutes, and the applicant is usually busy and frequently interrupted by employees and the telephone. Such an examination is only 25% satisfactory. Suggest that Agents be required to give a written report, stating reasons for such requests in every case. You would thus have a list of Agents who require hurried and outside examinations in every case."

"Yes, competition is keen. Everything is done to make it convenient for the prospect and he is rarely asked to go to the doctor. Arrangements are made for surprise attacks by the examiner, who is expected to swoop down and obtain signatures when and where evasion is embarrassing."

"Is largely dependent upon how thoroughly the insurance is sold. The reluctant applicant is always difficult to control. The thoroughly sold applicants rarely present any difficulty. Often when the appointment is made at the applicant's place of business, the surroundings are so unfavorable that one

is compelled to refuse to go ahead with the examination."

"No—I have always stood very firm for a complete examination. It makes no difference who the applicant may be, whether a millionaire or a laborer, if I deem it necessary, I courteously but firmly insist that I be allowed such privilege to go into every phase of the examination."

"That depends wholly on the Agent. The only satisfactory place is at the examiner's office where privacy is assured. A careful examination made under these conditions lends much to establish confidence in the applicant and greater respect for life insurance in general, and the Company in particular. The contrary is most noticeable when it is necessary for the examiner to go to the applicant for the examination."

"Yes—at least half of the Agents make light of the examination. So, frequently the applicant thinks it is quite unimportant and it takes time and tact to get him in the attitude which should have been sold him with the policy."

5 Do you believe that a thorough and satisfactory examination of the heart **can not** be completed without examining the heart with the applicant in both the upright and reclining positions?

"Yes"—unmodified—88

"No—except in selected or suspicious (heart murmur, rheumatic history) cases"—68

"No"—unmodified—64

"No examination of the heart is complete or thorough unless it has been done in the upright and reclining positions, and before and after exercise."

"No—examination in the upright position, before and after exercise, is certainly satisfactory and thorough enough for all practical purposes."

"Yes--it is common practice, especially in mitral stenosis, to find murmurs only when the applicant is on his back or turned slightly to the left side."

"No—exercise will bring out more organic cardiac defects than examination in the reclining position. Again, most examinations are made away from the office or Agency medical room and it is impossible to place your applicant in the reclining position."

"It is a well known fact that a heart examination can not be considered complete without placing the applicant in the reclining and left lateral positions. At any heart clinic one can demonstrate diastolic apical murmurs which are audible only in the left lateral position and occasionally on bending forward. At this point attention should be directed to the fact that a fluoroscope and electrocardiograph must be considered indispensable for a complete examination of the cardio-vascular system for the reason that these tests bring to light certain defects which are not discoverable or which may be overlooked, if only other means of examination are employed. The objection is often raised that even these tests may fail to reveal existing impairment. In this respect they share, of course, the limitations of all other modes of examination. This offers an obvious analogy with blood pressure reading. This determination also yields indispensable information, and yet normal readings are obtained in pathological cases; or abnormally high readings may actually become "normal" in myocardial failure. The expense involved in securing a heart examination as complete as our present state of knowledge permits, seems to be insignificant in view of the greatness of the risk involved."

"I do not believe that a thorough examination of the heart can be made without having the applicant in a place, at a time, and in a locality where you can

do what you think should be done to definitely satisfy yourself as to whether the heart is functioning correctly or not. This I believe is a personal element with the examiner, depending a great deal on his knowledge of cardiology, his experience, and his use of these factors."

"Yes—I am sure the upright and prone positions are necessary. I have in mind the 'silent mitral'."

"Yes—heart lesions often passed in upright position will be caught in reclining position at once."

"Border-line cases must be examined both in the upright and reclining positions. All other cases can be satisfactorily examined in the upright position alone. It would not be practical to require examination of the heart in the reclining position as a routine."

"Yes—functional aberrations usually disappear in supine position. Certain mitral lesions evolve in supine position."

"Unquestionably if all applicants were examined in both positions fewer heart lesions would be missed. However, in the younger ages and in the absence of a history of the heart disease producing infections, the incidence of error when only examined in the upright position would seem to be very slight."

6. Have you any suggestions to make with regard to fostering a friendly spirit and one of respect between the examiner in the field and the agency force?

"Getting together—examiner talking at Agency meetings and exchanging points of view"—28

"Fairness, courtesy and yet firmness, tact, and dignity on the part of the examiner in all of his dealings with Agent and applicant"—81

"Depends largely upon attitude of General Agent or Manager in backing up the examiner and assisting him in carrying out his accountability to the Medical Department"—10

"'Not easy to serve two masters'—cultivate respect and not friendliness"—4

"The examiner should be available, prompt in his appointments, and complete the examination and the blank as expeditiously as possible"—12

"Medical Department to control the appointments and number of the examiners, and see that he is not penalized by the agency force for performing well his duties"—16

"Impress upon the Agency force that the examiner merely reports his findings, and that the Medical Department does the approving and declining"—10

"Fees of all kinds should be paid by Home Office so that no money ever passes from Agency or applicant to examiner"—5

"Have the time of examination made to suit the examiner somewhat, and give him at least an hour's leeway. Do not look upon him as merely the hired man to fit into the whims of the Agent and applicant"—6

"No suggestions"—48

"The conscientious and careful examiner should have the full support of the Home Office Medical Department. The difficulties that arise have been with the General Agents rather than the Agent himself. The General Agent is usually in close touch with the Home Office, and confidential information sent in by the examiner frequently leaks out through him to the Agent. Immediately complaints are made and new or alternate examiners are requested, thus starting a vicious circle of prejudice, distrust, and ill will."

"Standing of medical examiner in his community should be such as to demand the respect of his colleagues by his ability in his professtion, by being uniformly courteous and at the same time demanding respect from the field force. One more question might be added to your list: 'Should the Agent at all times

select the examiner?' Many times a careful examiner is not given his share of the work simply because some field man passes the word that he is too particular. This is not conducive to good work."

"In regard to question 6 of your questionnaire, I should like to enlarge upon my answer. It seems to me, from the work which I do, that the relationship between the examiner and the agency force depends entirely upon the attitude of the General Agent. After the latter understands and is sympathetic toward the examiner's problems, there is little trouble. If, on the other hand, he is one of those spirits who believe the Agent is always right, there is a great deal of trouble. It has always seemed to me that a great deal could be done by the Medical Director of the Home Office in educating the General Agents. Furthermore, I believe a more friendly spirit could be developed by having the medical examiners from time to time give short talks to the Agency force.

"No. It is hardly necessary. The good examiner is the one who regards himself as the Company's representative in the field. No one else can take his place. The General Agent is being driven constantly to equal or exceed his last year's business. The Agent regards the examiner as a necessary pest who ever so often rejects a case. Both General Agent and Agent are biased. They may honestly think that their clients are being discriminated against. Occasionally actual dishonesty occurs but not, I think, more than in any other line of human endeavor. Many Agents give me a history of a sub-standard case and ask my advice concerning the propriety of turning in an application. In not a few instances I have recommended an examination and have been able to turn in as standard risks applicants previously rated as sub-standard, to the gratitude of the Agent and applicant. This relationship, I think, brings about a

feeling of respect on the part of the Agent which is much more important than a 'friendly spirit'."

"Make it a rule to have the Agent give the telephone number with the appointment and address, so that if the examiner is going to be late he can telephone the applicant. Be prompt at appointments. Never lose patience with the applicant, although he has disappointed you repeatedly on keeping his appointment. Consultation of two examiners is very desirable when a border-line point has to be decided."

"The Company should give to the Agency the names of a limited number of examiners, with any suggestions they may care to make to the Agency Manager. It is then up to the Manager to see that each Agent becomes personally acquainted with the examiners, location of office, office hours, etc. It then becomes largely a matter of individual adaptability."

"A mutual understanding that the examiner is paid by the Company and cannot represent the interests of the Agent or the applicant as against the Company."

"I believe an attitude of staunch support by the local Manager will control most situations. Also the inclusion of the examiners in luncheons and banquets, etc., helps."

"The main reason for the lack of a friendly spirit and cooperation is the freedom of the Agent to choose his own examiner. He can make most inopportune and unreasonable appointments for the doctor (often in order to be able to get some other examiner). Again, in points of dispute, the Company usually decides in favor of the Agency forces."

"See the applicant rather promptly. If he is the 'ill-at-ease' type, impress him with the fact that you are trying to accommodate him and that he is now transacting one of the most important pieces of business he ever transacts—not only regarding insurance but

as a health measure. Have the examiner thoroughly sold to life insurance, himself, and not so 'tight' with his professional time but that he will answer civilly certain health examination inquiries on the part of the applicant."

In other words, act as counsellor as well as examiner. (Editor)

"Let the Agency force feel that the examiner is an employee of the Home Office and that he is not dependent for his position on the whims of Agents; then have General Agents have meetings to foster friendliness and to smooth out misunderstandings."

"This depends upon the quality of the Agency force and the examiners. If the superintendent of the Agency is only interested in the total business produced, the examiner has a sorry time in his effort to do good work and to keep his self-respect. The Agent should not be permitted to choose the examiner. Some method should be devised whereby the total number of examinations per month should be divided among the examiners, by a disinterested party, proportionally according to the seniority or standing of the examiners."

"In view of much information in possession of the Home Office as regards the insurability of the applicant, aside from the physical condition, I feel that an examiner could best remain in the good graces of an Agent if the Agent knew that the Home Office has made a ruling that the examiner has no authority to discuss the insurability of the applicant, since the examiner is not in possession of all the factors that enter into the issuance of a life insurance policy."

"Two essentials: 1. The doctor should get the insurance point of view as soon as possible, namely, promptness in making and keeping appointments, and considering every applicant insurable unless proven other-

wise. 2. The Agent should respect the doctor's time. If these two are reciprocal, nothing else matters."

"I feel that the rule requiring the Agent to pay for the examinations that are rejected works to the detriment of the Company because: the doctor will not expect the Agent to pay or will not require him to do so for obvious reasons if the insurance is not sold; the prospect is rejected but not sent in to the Home Office—he goes elsewhere and obtains a policy from some company or through some other examiner more lax in his examination."

"Some companies force an examiner to rely on the Agent or upon the applicant to pay the fee for short form examinations, as reinstatements, health certificates, additions of disability benefits, etc. This should never be done, as the examiner is often beaten out of his fee by unscrupulous agents, of whom there are not a few, and the examiner naturally discriminates between the Agents."

"To the best of my judgment difficulties between the examiner and the Agency force are the direct result of unfavorable medical reports, whatever other reasons may be given. It is easy to understand the psychological bases of such feelings, but I believe the difficulty could be minimized and the usefulness of the examiner could be increased by strengthening his prestige and standing. I have in mind the fact that medical directors of companies are generally regarded with respect and friendliness although they are actually the final judges and directly responsible for declinations. I believe this difference in the attitude towards physicians in the Home Office and the physicians in the field lies in the fact that the Medical Director must be regarded as an unavoidable factor and it is recognized that his judgment and good faith must be accepted. In the case of the field examiner, on the other hand, agents can and do, as a

matter of fact, vent their disappointment by transferring future appointments to other supposedly 'easier' examiners. It would be very helpful if the Home Office reminded the Agency force from time to time that the nature of the work requires rigid adherence to a number of important rules, such as the requirement that specimens must be forwarded where abnormal urinalysis findings are encountered.

The position of the field examiner is also occasionally damaged by leakage of confidential information at Home Offices and also by the reading of medical reports which are frequently misunderstood and which may appear unnecessarily detailed to the lay mind.

Another serious difficulty confronting the examiner is the method of distributing appointments for examinations. Either the agent takes care of this or a telephone operator or one of the clerks is entrusted with this duty. I believe that such customs are quite improper in view of the importance of this function. It it quite obvious that an excessive latitude in the selection of the examiner operates automatically against those members of the examining staff who have developed a reputation for painstaking examinations and for the discovery of unfavorable histories or impairments. Furthermore, the resistance against such examiners automatically increases in proportion to their efficiency. Agents are prone to justify their attitude by describing such examiners as too 'technical' or too 'fault finding'. It should be a simple matter for the Home Office to measure the merits of such statements.

In other words, the Home Offices should make sure of the calibre of their field representatives by setting adequate standards; and they should make efforts to lessen the present wide variations in medical standards and underwriting practices of the various companies which frequently have a demoralizing ef-

fect. If the Home Offices have satisfied themselves as to the qualities of the field examiners, they should endow them with a wide measure of power and prestige and security of tenure. It may be added at this point that the requisite qualities of field examiners are not limited to medical ability but must include a suitable personality for contact with the various types of applicants, a knowledge of the Agent's problems and difficulties and the sympathy and cooperation that is bred by such knowledge, and, finally, a certain measure of 'salesmanship'. Likewise it is desirable that the Agency force should become better acquainted with the inherent duties of the Medical Department. I believe that such better understanding would materially lessen friction and unreasonable expectations on the part of the lay force. Progress in these directions cannot fail to increase respect and cooperation between agents and examiners and to benefit all concerned.

7. Have you any suggestions to make with regard to a closer cooperation between the Medical Departments of Life Insurance Companies and the General Practitioner of Medicine?

Many of the examiners in their answers included the examiner himself as a member of this group, and consequently their remarks were with reference to the relationship between the Medical Department and the examiner.

Number making suggestions—160

No suggestions—60

"Policies and insurance slant to the examiners by regional meetings or by pertinent and concise instructions."

"Frequent visits, or at least once a year, to the Agency by a member of the Medical Department."

"Cut out formal letter and deal directly with examiner by a letter from the Medical Department, and not through the Agency."

"Adequate fees for extra visits or observations."

"Send the examiner, when he deserves it, a letter of commendation now and then. Don't limit your letters to those of criticism and fault finding."

"Causes of any adverse action should be sent to the examiner and not to the Agency."

"Make Agent respect the doctor's time, giving him at least one hour, with regard to appointments, and not tell the applicant that the examination is a trifle."

"The applicant should be 'sold' by the Agent, and not expect the doctor to sell the insurance."

"In dubious cases pay for special examinations."

"Pay a fee to the chief medical examiner according to the size of the policy—companies get as good an examination as they desire and pay for."

"Pay a fee to the attending doctor or his secretary for information sent on request of the applicant regarding past illnesses or operation."

"Send a letter of acknowledgment and thanks from the Medical Department to the attending doctor or specialist for information furnished—not merely a formal letter."

"Requests for information should be based on strictly ethical grounds—a signed permission from applicant to family physician or operator for information to be furnished."

"Treat information obtained from attending physician by the examiner or by letter as strictly confidential—should not be passed on to General Agent or Agent."

"Letters to general practitioner of a pertinent and individual nature—not a long list of troublesome routine questions."

"General practitioner's report always favors his patient —place more reliance on that of the examiner."

"Examiner should be a good mixer and have the confidence and respect of his professional brethren."

"Many clinicians believe that insurance companies do not desire a thorough examination."

"Can be no close cooperation as they are not economically interested."

"Fostering periodic health examinations."

"I find that the general practitioner is becoming somewhat reluctant to give information to insurance companies in regard to their patients without presenting a fee or a bill for same. I must confess that there seems to be a certain amount of justice in this, as in some cases a good deal of time is used up in writing letters. Possibly a small fee for this work would be some help. In this regard, I have no other suggestions to offer."

"I have only one suggestion to make to you on this question. As you have in your compilation of figures a thing of great economic value to the community and one which has not been properly recognized on the programs of medical meetings, except in a more or less perfunctory way, or as quoted by some writer who sees the value of the figures, it seems to me that the insurance companies should be given a place and position of importance in many of our scientific meetings. No one man has a long enough personal list of mortality and morbidity figures that would approach those given by the life insurance companies. Again, I believe, your compilation of figures show about as quickly as any one's those changes in mortality and morbidity figures. It would seem logical and pertinent to the groups that are meeting in a scientific way to have explained to them your figures and their analysis in such a manner that it would be of help to the gen-

eral men. This method would also be an assistance, I believe, in the getting together of the men doing life insurance work, to the men indulging in the various specialties in Medicine, and I am sure would be of great interest to every one. I believe, also, that most of the medical men working in the Home Office would welcome the opportunity to fraternize with the medical men in these groups, and that the stimulation given would be of mutual value."

"Select examiners from among the general practitioners. The high qualifications now demanded by 96% of our medical schools make most licensed practitioners capable of doing satisfactory work. Some check on his conscience is therefore a remaining factor of importance. It occurs to me that in hospital communities a check given the insurance company by the chief of staff of an A-1 hospital would be of considerable assistance. The companies would do well to instruct their examiners and prospective ones with regard to insurance medicine. This could be done in a general way through medical schools, through internship training, and through the county and possibly state medical associations. A representative from the Medical Department or from the district office might appear with a subject at the state or county society, which was so worded as to appear attractive, and it is my opinion that he would get a favorable hearing."

"This is a most important point. As a practitioner of medicine I have frequent requests from other companies for information. These requests always ignore or make no mention of permission given them by the applicant to secure this information, nor do they ever offer to reimburse the attending physician for his report."

"Yes—increase examiner's fees for extra visits and observations. We don't see our patients several times

without charging for each examination. You are asking too muck for $5.00."

"This is a commercial era. The general practitioner likes to be paid for his work, as he also has an overhead expense. The way to encourage his cooperation is to pay him for his report. His sense of honor will compel him to furnish a comprehensive and truthful report."

"Only one. All communications with the practitioners should be from physicians and not clerks or secretaries. Routine form questionnaires should be used with great discretion. I feel that a stupid, careless, or ridiculous questionnaire is a very poor advertisement."

"Be careful not to enter into a controversy with the attending physician regarding hypertension. Tell him that blood pressure from the insurance standpoint is different from that of the clinician, and whereas it places the applicant in a group that gives an increased mortality, it does not imply that he is a sick man."

"Much misunderstanding exists because the general practitioner insists on individualizing, while the insurance company studies its cases in groups. If this difference could be made clear to the general practitioner it might be helpful."

"I have often wished to know what risks examined by me have died, how soon after examination, and the cause of death of each. There is little incentive for careful work unless there is some form of recognition of the same."

"Difficult to improve. The general practitioner will usually shield his patient and attempt to secure protection for him."

"Suitable voucher should be mailed immediately to Home Office on each examination. If Agent with-

holds examination or application he should be held for fee."

"Ask for data as a favor. Do not demand it as a right. If it will take much time, pay the general practitioner as for an office visit."

"The most important suggestion is an adequate fee. The general practitioner knows nothing of promptness as applied to insurance examinations."

"The health examinations offered by the companies should be routed to the examiners, and the records handled as private cases."

"My experience of nearly twenty years examining leads me to believe that many, if not most, of the letters emanating from the Home Office are written by clerks or first year medical students. They nearly always sound like book learning and complete unfamiliarity with clinical medicine. Too often the information is utterly unreliable and the examiner is placed in a ridiculous position when he questions the applicant along the lines requested. Also, many of them seem to carry a thinly veiled contempt for the examiner. I am driven to soliloquize, 'Man, poor man, clothed in a little brief authority, etc.'. I have no doubt that our stupidity or failure to get things from the Home Office standpoint must be maddening at times. Our clerical errors or omissions must be more than annoying, but do not forget that the little we know about insurance examining is only what we have been able to pick up. We have never been instructed in any satisfactory fashion. Try as I may, I cannot rid myself of the feeling that there is a never ending battle on between the examiner and the Home Office. Such friction should be eliminated."

"Because of the insurance companies' habits of basing risks on mathematical and statistical figures and not so much on the merits of the individual case—I believe

a rift will always exist between companies and practitioners unless they can be instructed in the insurance slant."

"Medical Directors should be doctors and not merely business men; should keep up-to-date; should have enough spine to back up the efficient and honest examiner; remove the examiner's dependability on the Agents for the number of examinations he gets; and rely more on the reports of the examiners."

"Choice of examinations and examiner should not rest with Agents individually."

"More backing up of the examiner by the Medical Department and not allowing the examiner to be imposed upon by the Agent."

"Fewer examiners so that the experienced ones may have sufficient work to keep them interested."

"The examiner to collect no fees for reinstatements, attaching disability to old policies, etc. All fees should be paid from Home Office."

"I think form letters from the Medical Director on various matters pertaining to Medical Department procedure as well as the discussion of interesting and unusual cases taken from the records would be most instructive and helpful. These I would send at relatively frequent intervals, perforated for filing in an attractive leather binder with the name of the company stamped on the face."

"That the company always furnish authority of applicant or the insured for the practitioners to divulge information; and that the company never shall use technicalities to pervert the statement of a practitioner to a use against the interest of the insured."

"I think instruction in insurance medicine ought to be included in medical school lectures on practice. If the practitioners knew more about the life insurance

point of view, they would not be so sore when their pet patients are turned down (especially after being told they are first class risks and the companies are crazy)."

"Can be no close cooperation. The practitioner is frequently antagonistic to the examiner and Medical Department because the practitioner does not look with an insurance slant or perspective."

"Yes. Life insurance examinations should be made by men of sufficient clinical training to give the Home Office a word picture of applicant. Many general practitioners, if they are men who keep case records and make a practice of details, are the most valuable examiners, and more dependable than the present day specialist."

"Yes. I do not think that the Medical Departments of Insurance Companies, with a few exceptions, properly appreciate their medical examiners. The agents are allowed to select their own examiners from a rather large list and they naturally favor the examiner who is the most lenient with their applicants. In my judgment there should be a chief examiner in every fairly large center to whom all cases should go, or if he is unavailable this should be so stated by the chief examiner **in writing** and he should have the power to assign another examiner to the case. He should be the company's representative in every sense of the word and treated accordingly. It is the height of absurdity to expect to pay an examiner the same fee for a twenty to fifty thousand case as for a thousand dollar one. No lawyer would do it and you, yourselves, do not ask the same premium. You expect your applicants to pay in proportion to the amount of financial risk you assume. Yet you cooly ask a great profession to assume an enormous responsibility for a miserable fee of say $5.00. For the most part

you are getting what you pay for. As I look about at the list of examiners of the larger insurance companies, I find that with few exceptions you are not getting the best medical men in the community. When such men do appear on the list they are given very little work, as they are said to be too strict. The fact is that they are above the average ability and are able to detect impairments with greater accuracy and in the early stages. The legal profession very justly demands a retainer for its relationship to corporation work, and I think this is what the insurance companies should do for their chief examiner in large centers of population. The chief examiner is often asked to suggest men for examiners in the same place or in outlying districts or to pass upon the qualifications of men who have already been appointed. By some such system as I have outlined, a few extra thousands paid to the medical examiners would be repaid many times over by the savings in mortality. I could give you dozens of instances in which I have checked up on examinations and perhaps rejected cases that had been passed as standard some days or weeks previously. You see, I am talking freely and perhaps with some heat, as I am thinking seriously of giving up insurance examinations, except for two or three companies that have adopted a scale of remuneration more generous than that usually prevailing. As it is, I do very little examining at present except in the problem and border-line cases and those involving large amounts of insurance. I give them the same care and attention that I do to private patients that pay me three to five times as much, and the agent brings them to the office and expects them to have immediate attention, to the detriment of my own practice. These things are entirely unfair from the view-point of the examiner."

Dr. Sykes—Dr. Old is to be commended for the work that he has done in bringing before this Association the attitude of a large number of our leading medical examiners towards insurance companies, as evidenced by their pertinent replies to his questions.

It would be impossible to make comment upon all of the valuable information developed in this investigation, but there is plenty of food for serious thought for all of us to study our problems as seen by our medical representatives in the field.

It is evident throughout the answers that there is keenly felt a lack of protection by the companies. The large number expressing the feeling that examinations should be mailed to the home office cannot help but be the result of their experiences. They know when they submit facts unfavorable to an applicant that unless the list of examiners is small and carefully controlled from the home office, that someone else considered more lenient will be employed in the future. An examiner should under no circumstances be penalized by the agency force for performing his duty. He is in the difficult position of not being in close touch with the home office, whereas the agency force has ready access to it. Another troublesome factor is brought out with reference to the receiving payment for the completion of all company blanks. It would seem that when an examiner fills out one of our regular blanks, that he should be assured the payment of the fee by the home office. From personal experience, since this plan has been inaugurated in our office, we have eliminated all complaints from the examiners with regard to their failure in receiving their rightful fee. We pay all fees direct from the home office for the completion of the company's regular blanks and our agencies are billed for the fees that the applicants must pay.

It is my belief that without the protection of the examiners' interests by the home office, there can only develop that sense of lack of security which is not conducive to good work.

Many of the points brought out by the examiners are difficult of solution and many are problems of human relations, but one

of the most interesting reactions is the expressed desire for light on life insurance medicine. It would seem that there is a real opportunity for educational work if undertaken by concerted action. There are many channels where educational work could be done and it would be real constructive work.

There is another angle of the educational work that we should not lose sight of and that is in dealing with this problem in agency meetings. I have frequently told groups of underwriters that when they handle examiners with the same tact and consideration that they do their applicants, their examiners' problems will disappear. It is also equally true that the attitude of the agency manager or general agent toward their medical examiners is reflected throughout his agency.

I believe that when we all insist on better examinations, we will secure them. While we may have to revise our schedule of fees in accordance with the amount of the risk involved, I am not at all sure but that this would be to the benefit of our great business.

Dr. Alton—The value of Dr. Old's admirable paper is that it does not present theory or opinion, but the actual views of examiners in the field as based on experience and the relation of insurance examining to daily practice, and in the wide range of matters discussed it is possible to comment on only a few of these which are of chief importance, and, while consideration of the wide range is tempting, I will speak briefly of—

The Examination Blank
The Place of Examination and
The Fee

The Examination.

I do not find it possible to dissent from the opinion one examiner expresses in Dr. Old's paper that "with a few exceptions, the blanks are antiquated though exhaustive but not comprehensive of the latest advances in medical science. They have

not been re-constructed to keep pace with the manifold provisions of modern life insurance policies."

The experienced examiner will exercise his judgment and diagnostic acumen and will elicit facts suggested by the questions, but a large number of less experienced or casual examiners will be content with answering the questions as they stand. Consequently it is hardly prudent to depend on what the examiner might do but which many of them rarely do.

It seems evident that the present form of examination dates from the pre-disability period and its questions are not so conducive to information anticipating early morbidity, as possible longevity.

The discussion of this matter by the field examiners seems to reveal the fact which I think has long been patent to many of us that too much of the time allowed for the examination is absorbed so thoroughly by questions of secondary importance that little time is left for a thorough examination by which alone incipient pathology of heart, lungs and gastro-intestinal tract can be detected.

The medical examiner is so absorbed with the numerous questions that he is apt to fail in the inspection that would reveal an anemic or other pathologic condition which might be the early suggestion of a coming disability, whereas the diagnostician in practice, taking ample time for his examination, would make quick perception of his patient's condition with perhaps but few questions pertinent and searching.

This comment will doubtless lead you to understand my predilection for appointing those who in general practice are devoting themselves to diagnosis or, as they have come to be known, "Internists". Their main thought is the recognition of pathologic conditions, if possible in their incipiency, the matter of care and treatment is secondary.

These men when they can be secured make excellent examiners and seem to have a systematic method for discovering impairments with or without reference to the questions on the blank but they usually expect to make examinations at their office.

After careful study of disability claims, brought to my attention at times, it is my frequent custom on discovering the cause to be T.B. (sometimes other diseases) occurring apparently too soon after the examination, to write the examiner—not critically but to tactfully inquire into the methods of his examination—where it was made—had the clothing been sufficiently removed—was the applicant in a reclining as well as upright position—was there careful palpation of the abdomen—and similar questions depending on the disability. My object is of course to stimulate greater care in the future. My frequent visits to examiners in the field and my correspondence during the past fifty years have revealed to me the constant need of observing the work of the older appointees and painstakingly instructing new appointees, hoping by their cooperation to secure the best results from the examination as it is and to minimize, or at least modify, the various adverse elements with which they have to contend in a professional effort to meet commercial demands.

The selection of the place at which the examination is to be made is to us all a matter of concern. We generally concede that the doctor's office should be the one and only place for perfectly satisfactory results but the agent feels he cannot always secure this—it may be his fear of losing his prospect that deters him, or his desire to in every way oblige his applicant—but at any rate the examination is frequently arranged by him for the time and place most easily suited to the applicant's business. Most examiners try to be obliging but comments like the following, which have come from some of our examiners, show us their conscientious feeling and desire, and these fully corroborate the expression of opinion given by Dr. Old's correspondents.

One examiner, an Internist says:

"I am opposed to making examinations at the applicant's place of business, except under exceptional circumstances, for the following reasons:

"A. Lack of privacy.

"B. Poor audibility.

"C. Hurried by applicant due to press of business.
"D. Inaccessability."

Another, devoted largely to insurance examining, says:

"I believe that I can conduct a more complete and satisfactory examination in my office than elsewhere. I feel sure that the Medical Department prefers that its examinations be made under these more favorable circumstances. It has been my experience that the applicant is more satisfied with a complete and carefully conducted examination, and is thereby more favorably disposed to the Company requiring the examination and more satisfied with the policy when issued. I know that on many occasions the agents have increased the amount of insurance applied for after a careful and complete examination at my office because of the applicant's greater confidence in the Company and his increased respect for life insurance and life insurance methods. Even when the amount applied for is not increased, it seems to me that if the applicant, the Home Office, and the examiner are better satisfied with an examination so conducted, the agent should be also."

Another general practitioner says:

"It is very seldom when an examination is made in a man's place of business that the doctor is not forced to take quite a little for granted as regards physical signs upon examination of the heart and lungs because of undesirable surroundings such as machinery, typewriters, tickers and street noises. Another objection I have is that in the modern city, parking is at a premium, and often impossible in the business district, making it frequently necessary for me to refuse to make examinations.

"A slightly more desirable place is the applicant's residence. However, I frequently find it so happens that these applicants either apply for such a large amount of insurance, or are of the minimum or maximum weight that they are required eventually to come to the doctor's office to be weighed, unless the Company is willing to accept the ordinary penny scales at a drug store which are about as accurate, I consider, as my guess. I

find in questioning these men that it would have been just as satisfactory to them to have been examined in the doctor's office if the agent had not been paralyzed with fear of the possible cancellation by the applicant of the appointment.

"I am willing to examine away from my office so long as the appointment is made at a time which does not conflict with practice which I will not sacrifice, as it has been well demonstrated that the volume of examinations has been gradually reduced through the adoption of the non-medical application, and the trend has been toward wider use of this method."

And lastly this from another general practitioner:

"My office is my workshop and I feel this is the logical place to make an insurance examination but I have never refused to make the examination outside, excepting in factories where the noise of machinery precluded a satisfactory examination of the chest. The older solicitors saw to it that the applicant came to the examiner's office but nowadays I sometimes think they use our service in landing the prospect."

As to fees, I will not further burden you. I freely expressed myself on their inadequacy at a former meeting. I can only say that more and more physicians I would choose are declining our appointments because of the many extra requests for specimens, blood pressures, etc., which we expect the regular fee to cover, but which involve so much of a busy practitioner's time which he feels he can ill spare from his practice which means his livelihood.

The time will come when we shall feel that these extras should be considered as other office calls would be, and then to the general practitioner and Internist, especially in our big cities, our examinations will take a more prominent and respected place.

All companies are striving for more business. The securing of this at times tends to haste and laxity in medical inspection, and the crucial point for the Medical Board to decide is, can we afford to have this increased business without satisfactory medical examinations properly made and properly paid for.

In the line of constructive suggestion I would recommend:

1. Such re-formation of the examination blank as will comport with present insurance requirements and furnish a more exact basis for estimating mortality ratios.

2. Insist that the place chosen will permit an examination that furnishes fact rather than fiction.

3. That the well chosen examiner, being of your profession, is entitled to your considerate courtesy and is worthy of his hire.

DR. ALBERT A. MACDONALD—Mr. Chairman and Gentlemen: It seems like presumption coming from a smaller place, a smaller Company, and addressing you on this very important subject, which can be viewed from various angles, some of which have not been adequately touched.

I do not know of any college or university in Canada, at least, where they have a course of training for prospective medical insurance examiners. If medical students had proper undergraduate training, it would be better for the insurance companies. It is true that we select the men who have graduated from colleges and universities where we know that the training in general medicine is adequate, where we know also that the character of the applicant for a degree is carefully scrutinized. The reason is that in some, at least, of our colleges and universities the students are not as well grounded as they are in others. In some localities the medical men are more influenced by politics and religion than they are in others; also they have not the strong characteristics of being self-reliant. You will understand what I mean by that when I tell you that the first examination I made in a large center in Ontario for one of the largest and best companies was somewhat of a trial for one who seemed like a boy in comparison to the agent, who was a high-pressure salesman selling a large amount of business. He wanted to be in the room at the time of examination. I looked at the paper, which I had never seen before, but saw written on it that the examination should be made privately, no one else being present

in the examining room. So I showed the agent into the adjoining room, where I saw there was a plentiful supply of cigars and various other good things, but we did not join him until after the examination. I mention this to show that there is sometimes an influence brought to bear on our inexperienced medical examiners. The regular examiners will not be influenced. They can be trusted.

It is my practice in appointing medical examiners to try as much as possible to secure the services of those who are of fair age and have examined for other companies, who have a fairly active practice, who are devoted to medicine rather than to surgery, and to have in each city or town a chief examiner who is to be employed whenever possible but also have one or more alternate examiners to be employed when the chief examiner is not available. The instructions to the Managers and Agents, that I take great care to give, are to see that in the case of an agent requiring the services of an examiner, where the chief examiner can not be procured, to employ the alternate or to secure one of the best men available, get his application at once for appointment and send it forward, when we will investigate. I impress upon the agent the fact that such a course will expedite issuing the policy and will have a much better chance of being first in the field if they will adhere to the rules.

You, of course, who are familiar with all of those things, know what occurs. Just before I came away, in a small place where we have one or two good examiners, a stranger was employed. Now that applicant, who was a perfectly good risk, will have to be re-examined by one of our regular examiners, because the strange examiner who was employed happened to be known at our Head Office to be a man who is easily influenced by the applicants or agents, although he has a good reputation in other ways.

These are some of the points which I wish to make. Then there is another point that I mentioned before and I mention it again, and that is with regard to the forms that we use. That is more particularly of influence in the cases where we are called

upon to give re-insurance. Now the forms from the different companies are so varied—they may cover the ground, but one company will cover one portion of the ground to a much greater extent than another. We have tried to systematize the thing in order to give you all the salient features, so that I hope that there will be an effort made to have the forms more or less uniform, and I think it would be a good thing if we had policies that were not nearly as complex as the ones used today by most of the companies.

There are many other points that I would like to mention, but I don't want to occupy your time further. You, of course, know that the only safe plan is for the Company to choose the medical examiner. Now I may show you that more particularly with regard to Canada. We have in Ontario a very good class of medical examiners and medical men generally. It is quite true that the United States has taken from us a good many of our very good men, but nevertheless they have left us a fair average and we can rely on those in Ontario. I do not like to discriminate between one province and another, but there are some provinces where the universities do not come nearly up to our standard in Ontario. The men going through do not use quite as good English; in some places they are a little hard to understand. In dealing with what I call almost a foreign element—though far be it from me to say that our most loyal citizens, French-Canadian citizens, are foreign; they are not. In the West in the prairie sections, we have a foreign element that is very difficult to handle because they do not understand the standards of life in other parts of Canada and the United States. Further West, over the Rocky Mountains in British Columbia and Victoria you find medical men who understand insurance and are able to make good examinations.

I thank you for your patience.

Dr. Rollins—I don't suppose that I have any place in speaking at this meeting, but the paper of Dr. Old's was very favorably received by myself and was so refreshing, as it brought

to my mind about 38 meetings which I have had with our examiners during the past year. The question that comes to my mind is, "How is it that the examiners who answered the questions which Dr. Old asked them could restrain themselves as much as they did?"

There are just two points which I want to emphasize in his paper: The one that I received at practically all of these meetings was, "How do we protect our examiners?" They ask you that question. How far will we stand behind them? I do not think that we can over-emphasize that point. The second point was the one that Dr. Sykes brought out, the question of insurance education. In every single one of those meetings the doctors impressed me as being absolutely hungry for the insurance statistics which we are able to give them, showing them the importance, from our point of view, of given impairments.

In closing, I want to ask one question, "Do we, as insurance people, give our examiners a square deal?"

Dr. Old—I want to thank the gentlemen very much who have discussed this paper. They brought out a good many of the points that should have been emphasized.

With regard to the questions on the blanks, I don't think there is any doubt but that they will have to be changed somewhat. For instance, as you know, we are not getting diagnoses of cancer, especially cancer of the intestines and cancer of the rectum, and I think that is largely due to the fact that we do not ask anything about constipation. Constipation or indigestion occurring for the first time in any man after age 40 ought to be thoroughly investigated, especially if that man gives a history of having had hemorrhoids or having been operated upon for hemorrhoids, or if he gives a history that he sometimes has bleeding piles, because in a good many cases we do not get the loss of weight until the end or until probably the case has become inoperable. We had a case the other day of a man whose examination had been made on February 28. Everything was perfectly normal. The man never had been sick, attending to his

work every day, and had been operated on in 1919 for hemorrhoids. The policy was issued, and to show you that the man had no idea of his condition, an extra policy was offered him, which he refused. On May 1 he went to the hospital and had a colostomy performed. He had cancer of the sigmoid. He is going to be operated upon again later on. The only thing found afterward was that that man had been getting somewhat constipated.

I think, as some of those doctors suggested, that the question, "Have you ever been X-rayed or has it ever been suggested that you be X-rayed?" is a valuable one and will give us a lead.

If you ask a man if he has ever had any disease of the brain or nervous system, or disease of the liver or kidney, he is going to say "No". He doesn't know. Doctors don't usually tell patients what they have; they are satisfied to have them get well and are often uncertain of the accuracy of their diagnosis. So I think that by shaping the question so as to bring out symptoms and signs, tests, and treatments, we would get better results.

Now, as far as disability is concerned, I do not believe that the blank that we use for insurance is comprehensive enough to cover the disability cases. I think we have got to have one somewhat along the lines or including some of the questions that we ask in the health preservation service. Until we do that we are going to continue to have these disability claims six months and one year and two years after examination.

Regarding that third question, there are 134 out of 220 who said the examination should be sent directly to the Home Office. One doctor wrote me that he thought it ought to be done mainly on account of the confidential information that that report is supposed to contain. He said he examined a patient, a woman, and he didn't like her manner exactly. So he said on his approval, "Subject to a letter". He sent a confidential letter to the Home Office in which he stated that he hadn't liked the manner of this woman and that he had consulted her family physician, who was a good friend of his. This doctor told him

that just three weeks before she had been through an attack of manic-depressive insanity. Well, the Home Office in some way or other, I suppose, wanted to clear their skirts with the Agency force and evidently told the General Agent the trouble. This General Agent, in order to square himself with the soliciting agent, told him and the soliciting agent told the woman. It happened to be that this woman and the family doctor go to the same church, and one Sunday morning the doctor was talking to some friends. This woman came along, took an umbrella and broke it over his head, and asked him what he meant by saying that she was insane, or something like that. This man says he'll be damned if he will give any information to any insurance company again. These doctors haven't gotten over the fact that they look upon the statements of the applicants to them the same as statements from their patients, and that is a confidential report. It is largely for that reason, I think, that so many advocated sending them to the Home Office. I don't think there is any doubt but that if this is not done at least a voucher should be attached, although the trouble there is that if a doctor recommends on the part that goes to the Agency and then doesn't recommend the case on the voucher, there will arise a good deal of trouble or controversy.

As to Question 5, I saw some time ago where someone calculated that in this country all the thinking and all the progress in the advance of civilization depended upon two per cent. of the population. In other words, if that two per cent. died, we would soon be pushed back into the Middle Ages. This being so, taking the answers to this question into consideration, I would say the proportion showed up somewhat better than that. I would say that ten per cent. of the responses were from men who were well informed on the advancement in medical science, and who were thoroughly familiar with modern cardiology. I believe that any examination made by any man—I don't care who he is and how good it is, whether he is a referee or Home Office man or what—I believe any examination that is made in a man's place of business is worth only about fifty

per cent. of what it would be worth if that examination were made in a doctor's office. And these men laid stress on that fifth question, in which I asked about a man's being examined in the upright and reclining positions. There is no doubt that a heart is incompletely examined unless a person is so studied. You will not be able to detect the diastolic of the mitral stenosis unless you have them on their backs or turned on the side, and about ten per cent. of those doctors, or more than that, recognized that fact.

Questions 4 and 6 can be considered together as they concern the relationship of the examiner to the Agency force. It boils down largely to knowledge, experience, and tact on the part of the examiner, and the backing up of the examiner by the General Agent and the Medical Department. From my observation I can say that when an agent has an applicant for insurance, especially for a large amount, he is not his usual and normal self as regards reasonableness and gracious and complacent acquiescence to adverse findings on the part of the examiner. He is a neurotic, suffering from anxiety-neurosis. If the constitutional psychopathic state is kept in mind by the examiner and treated as such, many misunderstandings and brain storms will be avoided.

I am just going to say a word about the ideal examiner. One of the men—a man who evidently had been examining for quite a long time—brought out the fact that the examiner should not only be the examiner but he should also be a counselor to the Agency force and the applicant. We had a man—I think he examined for us probably thirty-five years—out in Pittsburgh who was the Agency doctor. He used to come down there every day for two hours and examine the cases that were brought to the Agency. A young man would come in who probably was going to be married and he would look him over. When he got through he would get up and say: "Young man, you are to be congratulated on having been able to pass an examination which assures your physical fitness. I want further to congratulate you, because young men ought to always assume

one of two financial obligations which they have to take care of. One of these is life insurance and the other is a piece of property." And then he would shake him by the hand. We don't have that now. I hope sometime the time will come when we will be able to develop men who will do just that.

As to Question 7, they emphasize a desire for enlightenment regarding insurance medicine and slant, and for being treated as members of a high and respected profession whose slogan is "Service" to the best of one's ability and knowledge.

It has been suggested in the past that some lectures on insurance medicine might be included in the curriculum of the medical schools. I do not believe that any faculty would be willing to add any additional lectures to an already too full course. I believe, however, that such a course could be arranged in the postgraduate schools, especially if we let it be known that the satisfactory completion of such a course would add many credits to an applicant for the position of examiner.

They emphasized the importance of all communications to the examiners or attending physicians and surgeons regarding rechecking or past illnesses of the applicant being written by a member of the Medical Department, and I know this point is well taken in order to obtain accurate and intelligent information. They emphasized the payment of extra fees for additional observations and collection of specimens, in case their original examination was complete and satisfactory and all the requirements had been met. I think nearly all the companies are now recognizing the justness of the claim "The laborer is worthy of his hire". They unanimously agreed that the general practitioner, the surgeon, and the hospitals and clinics should receive a fee from the Company for information furnished regarding their patients. However, they spoke in no uncertain terms regarding the obtaining of a written request from the patient before this information could be given.

For many years we have been notifying our examiners of the cause of death in applicants they have examined within five years, and also the cause for disability granted, with a very sat-

isfactory reaction. I was interested to see that many of the examiners recommended such a procedure.

In conclusion, I would say we have been given much meat for thought; and by backing up our examiners, and obtaining the hearty support of the General Agent or Manager with regard to careful examinations made under favorable conditions, we will obtain results favorable for a low net cost for insurance, adequate commission and renewal rates, and a satisfactory mortality.

FRIDAY AFTERNOON

DR. MUHLBERG—Our next essayist is endowed with the real spirit of research. His many valuable contributions have kept us abreast of the times, particularly in the matter of refinement of technique and correction of faulty methods.

I will call on Dr. Exton for preliminary remarks before asking members to discuss the last three papers.

THE PRESENT STATUS OF CLINICAL LABORATORY MEASUREMENTS WITH A PRELIMINARY NOTE ON ELECTRO-SCOPOMETRY

By William G. Exton, M. D.

Director Laboratory and Longevity Service
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GENERAL CONSIDERATIONS

It is generally recognized that every branch of science, excepting only the descriptive, is fundamentally quantitative and that improvements in methods of measurement are necessary for scientific progress. Thus the problems of the pure sciences are often wholly matters of measurement and in the applied sciences measurements are inextricably bound up with the very concrete matter of efficiency of production. Therefore, workers in the pure and applied sciences are always keenly aware of the importance of improving methods of measurement.

That physicians are not always alive to the importance of measurements is, however, evident in many ways. Thus a recent issue of a first rate medical journal contained, among others, two papers; one of which gave data to show that protein fractionations could be made more precisely by interferometry than by refractometry, while the other gave clinical data of cases in which proteinuria was a prominent characteristic, designating the protein concentrations by one or more crosses. Evidently a forward looking editor saw nothing incongruous in presenting in one instance methods of extreme refinement and in the other of extreme crudity.

Perhaps the dual conception of the practice of medicine as being partly art and partly science accounts for the merely inchoate appreciation of the value of precise measurements, because duality naturally tends to confuse and confusion seems to make it difficult for many physicians to distinguish clearly between

what is their art and what is their science. However that may be, it is, nevertheless, certain that the art of the diagnostician can only begin and function to best advantage after his science has developed as complete and accurate information as possible about a case. Therefore, physicians who are satisfied with anything less than the best information science can give them fail to do justice to themselves, their patients, and their art.

Of the tests most commonly applied in practice to develop clinical information those for protein, sugar and the formed elements in urine may be taken as examples of the illusory habit of trying to draw quantitative deductions from purely qualitative tests, which still persists among many physicians who have not familiarized themselves with the more pointed and useful information which the newer quantitative methods supply at no more cost in time and trouble than the older hit or miss qualitative methods.

Further, the trends of modern experimental medicine indicate that it will not be long before better clinicians will insist on learning not the mere concentration but the rate at which a patient excretes a particular substance, because that tells him much more definitely about his patient's excretion and is the truest of all criteria for comparing samples excreted at different times by the same individual. Being a simple correlation of time, volume and concentration the excretion rate, of course, depends upon accurate quantitations of the excreted substances, and the responsibility rests upon clinical pathology to provide better quantitative information.

All good diagnosticians aim at earlier and earlier diagnosis but advancement in this extremely important field is hindered by the deficient sensitivity of many tests in common use. Of these the tests for indican and ketones in urine may be taken as examples of the obligations of clinical pathology to provide not only more accurate but also more definite earlier information.

Again, there are certain kinds of very valuable information which are not available in practice as early and as generally as

they should be because their technics are too complicated and time-consuming and require the skill and equipment of trained chemists. Blood cholesterol, calcium, non-protein nitrogen, and the urinary ammonia are examples of this kind of information, and for the good of the public it is more than desirable that such technics be brought within the realm of clinical routine.

If there is any branch of medicine which is essentially scientific and therefore quantitative, it is that which has come to be known as clinical pathology, and it is the function of the clinical pathologist to provide complete and exact laboratory information and not only interpret such information but also indicate what kind of information may or may not be useful or suggestive in a particular case. Clinical pathologists should, therefore, be familiar with the newly won facts of experimental medicine because that special knowledge, hand in hand with the ability to perform more complicated procedures like sulfur partition or protein fractionation, often leads to clearing away the obscurities which surround doubtful cases.

These and other considerations show how vital to the practice of medicine is the advancement of clinical pathology along lines which broaden its scope and refine its technics so as to make them more precise and practical and therefore more generally useful. Inevitably every improvement in the accuracy and sensitivity of clinical pathological technics registers an increase in clinical abilities, which is only another way of saying that the progress of medical science depends upon improving methods of measurement.

Measurement of the many materials of clinical interest in the various body fluids usually involves both chemistry and physics. The chemistry has, of course, been contributed by painstaking pioneer work of chemists who, unfortunately, have not been accustomed to restricting bench manipulations to a minimum or dealing with limited amounts of material. Thus the literature of biochemical technics is rich in excellent methods which have never passed beyond the status of mere records and remain clinically useless because too complicated and time-consuming.

In fact, it has been the history of many of our most valuable clinical methods that after publication the technics undergo a series of modifications and simplifications extending often over years before they become useful for clinical routine. Undoubtedly the demands of science for precision and the demands of economics for simplicity and rapidity are somewhat conflicting, but the many successful reconciliations which have already been accomplished point unmistakably to the way of improving the practice of medicine.

Outside the laboratory when information is immediately needed, for instance in the operating room or at the bedside, a reasonable compromise between speed and accuracy is expedient, but conceding accuracy to convenience in the laboratory is never justifiable unless the resulting effects have been rigorously considered and are clearly understood, because every loss in accuracy means a backward step in scientific ability. That this situation is clearly understood by many clinical pathologists is evident from the continual search for more and more precise methods. That others do not appreciate it is evident from their willingness to employ inferior methods, usually because they have not progressed beyond a qualitative state.

HEMOGLOBINOMETRY

Its general application and great clinical importance account for the fact that hemoglobinometry is performed oftener than any other blood test. It also happens that during the past few years in journals and meetings both clinical pathologists and clinicians have expressed marked dissatisfaction with current hemoglobin methods. Hemoglobinometry, therefore, exemplifies the present status of colorimetry as practiced in clinical laboratories.

Van Slyke's oxygen capacity and iron determinations are admittedly the best of all hemoglobin methods. While exceedingly valuable for standardizing purposes and for checking other methods, they are, unfortunately, too exacting for clinical work. Of the methods practically applied, Tallquist's, Dare's, and

Fleischl's measure native hemoglobin. The other methods by more or less quick and simple manipulation convert hemoglobin into oxy-hemoglobin or the more stable acid hematin. All of them compare the color of the sample with some kind of standard by means of some optical device.

Not one of the methods has won its way into general use, and all of them have been criticized either as to accuracy or practicability. The existing situation may, therefore, be described as one in which many different methods giving inaccurate and different results are now being used in our clinical laboratories.

If some kind of animal or other source of supply of a stable hemoglobin solution containing say 15 grams per 100 c.c. were conjured up, all of the perplexities and difficulties that now beset hemoglobinometry would quickly disappear because such a mythical standard would enable a clinical pathologist to determine hemoglobin with whatever precision he desired. Thus, those disposed to speed at ease could settle on a weak looking standard and dilute the sample until the colors looked alike, or they might make different dilutions of the imaginary standard so as to have a series of concentrations in test tubes to slap against and compare with the sample in some sort of perforated box.

On the other hand, clinical pathologists intent on developing the kind of information which can be relied upon for close diagnostic reasoning, to tell them if their patient is anemic or not in border-line cases, detect and help them follow the course of hemorrhage, enable them to appraise the effect of treatment, or furnish data for correct statistics, these could secure the necessary precision by using an accurate instrument like a well made Duboscq colorimeter.

On final analysis then, it appears that the absence of standardizing difficulty resolves the matter of precision into a mere choice of measuring device.

Unfortunately, our imaginary standard is only one of the many ideal standards for measuring biologic materials which are also lacking. In the case of hemoglobin, Haskins and Osgood, [1] Cohen

and Smith[2] and others supply the deficiency by meticulously preparing standards from chance specimens of blood subjected to careful oxygen capacity or iron determination. Although theoretically correct and representaive of the best clinical accuracy now achievable, the preparation and maintenance of such standards are impossible in many clinical laboratories. It therefore happens that much ingenuity has been expended in the attempt to secure satisfactory substitutes which usually take the form of colored liquids or glasses.

The liquid standards are more or less stable solutions of inorganic materials or dyes. Their great deficiency, however, is that which they have in common with the colored glasses, and this defect is well illustrated by Newcomer's [3] experience.

As a result of his painstaking search for a standard suitable for use in place of a certain definitely prepared concentration of acid hematin, Newcomer found a substitute in the form of a disc cut from a particular melt of glass which happened to have a spectral transmission similar to that of his acid hematin. The Duboscq colorimeter was adapted for the disc and the manufacturer supplied standards cut from the original batch of glass as long as it lasted. The original Newcomer method is now necessarily limited to those already provided with the standard disc, and the instrument must now be applied to another method requiring a complementary light filter because the most expert technologists have never been able to reproduce the glass. As will be seen, Newcomer's is the only method employing a colored glass standard which is based on correct scientific principles and should not be confused with all the other colored glass methods.

In the early days of clinical colorimetry when the underlying optics were not so well understood by chemists and clinical pathologists many attempts were made to avoid the standardizing troubles of Duboscq colorimetry by employing solutions of dyes or inorganic materials. Experience, however, soon taught that Duboscq colorimetry loses accuracy when the spectral transmissions of standard and sample are not the same. For critical

comparisons the colored glasses, like the colored liquids, give misleading results, and so their use is limited to superficial comparisons. They are, therefore, fit only for rough matching with crude devices and the present unsatisfactory state of hemoglobinometry is due to the extensive use of such semi-quantitive methods.

JUNIOR SCOPOMETRY

Owing to the nature of dispersed materials the standardizing troubles of nephelometry and comparison turbidimetry are even greater than those of colorimetry and they account for the failure of these highly sensitive methods to give better results than the ancient disappearance or extinction criterion which needs no standards at all. To exploit this feature to the utmost the disappearance criterion was refined and improved and as made available in the Junior Scopometer measures turbidity with greater accuracy than other clinical methods and with no more time or trouble than the crudest of existing devices.

As a result of efforts to obtain similar advantages in measuring colors a novel extinction method of colorimetry was later incorporated in the Junior Scopometer [4] which frees hemoglobinometry and other colorimetric methods of all standardizing difficulties by substituting for the usual standards reference graphs or tables showing the equivalents of concentrations and scale readings.

In the case of hemoglobin, for instance, such a calibration is made by determining the hemoglobin content of a sample of blood known to be higher than normal by the exacting oxygen capacity or iron method. Another part of the sample, diluted so as to have a series of concentrations covering the desired range, is subjected to some pre-determined acid hematin or oxy-hemoglobin method and the disappearance points are measured in the Junior Scopometer. By plotting the known concentrations against scale readings the calibration is completed and thereafter need never be made again because the scale readings obtained by similarly treating subsequent samples are always referable to the original calibration.

Although the Junior Scopometer is more accurate and reliable and gives more uniform results than the so-called permanent standards or semi-quantitative methods, the extinction criterion has certain disadvantages which are inherent in the nature of its physiological optics and which prevent it achieving the accuracy of the best comparison photometry, because the human eye is unable to mark the disappearance of an object as critically as it can compare the brightness (color) of two specimens.

THE PHOTO-ELECTRIC EFFECT

The variabilities and limitations of human vision are such that physicists have always dreamed of emancipating optical measurements from the bias of personal equation, and a promise of the dream coming true was made almost half a century ago by the discovery of the photo-electric effect which transforms light into electricity by means of photo-electric cells. These take the form of glass bulbs containing two electrodes, one, the cathode, is light sensitive and emits electrons when exposed to light; the other, or anode, when subjected to positive voltage attracts and gives direction to the electrons leaving the cathode. An efficient photo-electric cell is, therefore, a valve emitting an electric current which is linearly proportional to the stimulus of incident light.

That the earliest experiments applied such a device to photometry is not surprising, and, as a matter of fact, photo-electric photometers were constructed and used by physicists within a year or two after Hertz's discovery. The early instruments measured the minute currents emanating from the cells with the most sensitive of known devices such as electroscopes and electrometers, and this, with other practical difficulties, necessarily restricted their operation to experimental physicists. It is interesting to note that after these early experiments the theoretical literature of photo-electricity kept growing while practical attempts to apply photo-electricity to photometry remained at a standstill until the thermionic amplifying tube was invented by De Forest.

Besides enabling measurements of the minute photo-electric currents, amplification confers other abilities and naturally stimulated a renewed and enthusiastic interest in the practical possibilities of photo-electricity which have since been realized and brought to the public notice in the form of talking movies, counting, sorting, smoke recording and advertising devices, television, etc.

Amplification also made photo-electric star, lamp and spectrophotometry practicable and has since been applied in many instruments designed to improve other photometric methods such as colorimetry and turbidimetry. Of these it appears that many have never been carried beyond the stage of design, that some were built for frankly experimental purposes, and that others, like Sheard and Sanford's [5] photo-electrometer, are more or less successful in the hands of their designers.

The photo-electric effect offers the possibility of combining in one method the convenience of Junior Scopometry with the accuracy of the best photometry because the electric eye is superior to human vision in its ability to mark the brightness of a specimen without a comparison standard. That an instrument adapted to the needs of clinical laboratories has not yet been made available must, therefore, be laid to practical difficulties and intricacies bound up with the application of photo-electricity.

The conditions under which measurements are made in clinical laboratories demand instruments having the utmost simplicity of design, rigidity of construction, the fewest possible adjustments, and the highest degree of stability with the greatest possible convenience of operation. The existing amplifying devices, on the other hand, require at least five different unvarying intensities of electric current (light, plate voltage, thermionic tube elements) which are usually supplied by sets of different batteries involving not only permanent but temporary connections with variable resistances, potentiometers, meters, etc., for providing the adjustments necessary to maintain calibration. These and other variabilities make amplification hopelessly impracticable for any but the exceptional clinical laboratory.

ELECTRO SCOPOMETRY

The possibilities of different glow tubes and other amplifying devices and circuits were tested in attempts to apply the electric eye to scopometry, and in the course of the experiments a number of arrangements were secured which functioned successfully when continuously watched, adjusted, and checked with meticulous care. In fact, several set-ups proved capable of an astounding degree of sensitivity and accuracy in the hands of a worker capable and willing to give them the necessary care and time. None, however, by any stretch of the imagination, could be considered safe and practical in the hands of the usual run of laboratory technicians, and it was plain that an instrument intended for their use must be free from the variabilities, complications and adjustments presently inseparable from amplification. Experiments were, therefore, directed to the possibilities of developing a photo-electric instrument that would give satisfactory results without amplification.

The general appearance and optical design of the Electro-Scopometer are shown in Fig. 1. It will be seen that two symmetrical optical paths go from opposite sides of the source of light to two similar photo-electric cells. In one path there is a receptacle for the cup containing the specimen, and in the other a graduated diaphragm whose aperture can be increased or diminished at will by turning a screw head which also indicates the size of the aperture on an attached scale. Parallel light is maintained throughout and the galvanometer scale is conveniently placed between the two optical paths. Operation is exceedingly simple. With the specimen or standard in place the screw head is turned until the galvanometer rests on zero. The scale reading thus indicated gives the measure of the specimen when referred to a calibration like those for the Junior Scopometer or to a standard if comparison photometry be preferred.

The simple Wheatstone bridge type of circuit is shown in Fig. 2, and it will be noted that the electric, like the optical, is a null method. Of the electrical elements it may be mentioned

that the type of Leeds and Northrup galvanometer which is part of the Electro-Scopometer has proven remarkably rugged and reliable under unusually exacting conditions.

The photo-electric cell is, of course, the heart of the instrument and it may be noted that there are many different kinds on the market which differ in spectral sensitivity, strength of response to a given stimulus and tendency to fatigue effects, as well as in size and shape. Therefore, the choice of cell depends on the nature of the material to be measured.

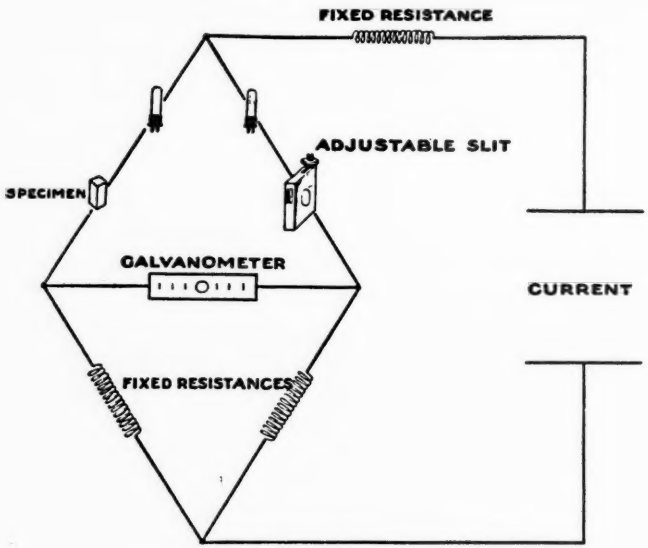


FIGURE 2

Electrical circuit. Note that all electrical connections are permanent and there are no electrical adjustments of any kind.

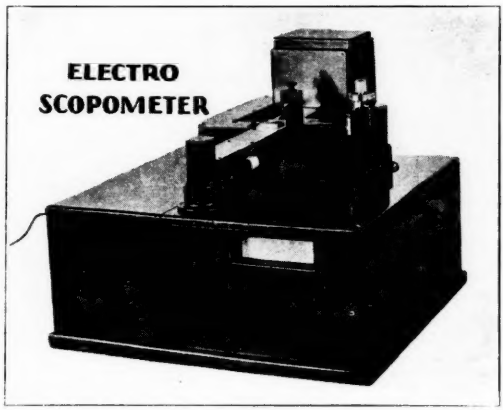


FIGURE 1
Last experimental instrument which is in routine use in the Prudential Laboratory

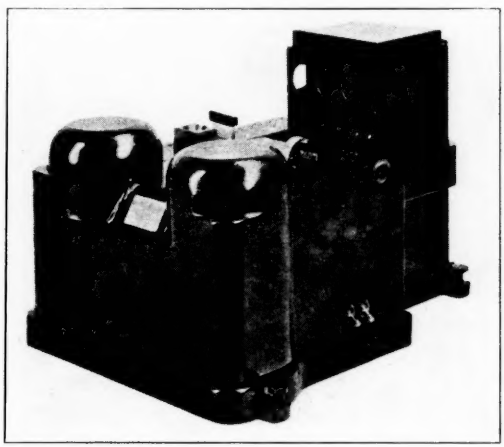
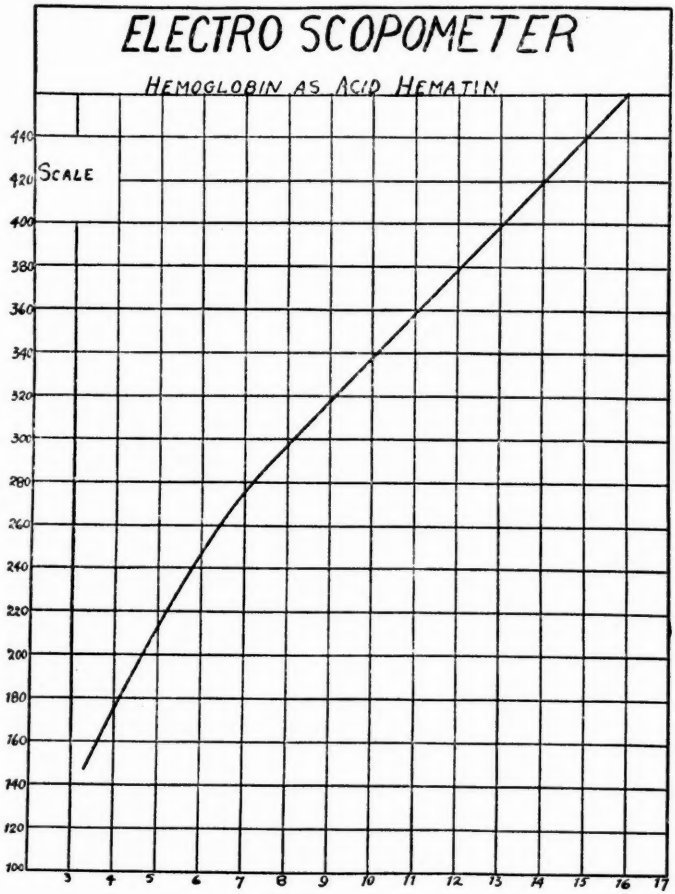


FIGURE 8
The Electro-Scopometer as it will be available shortly



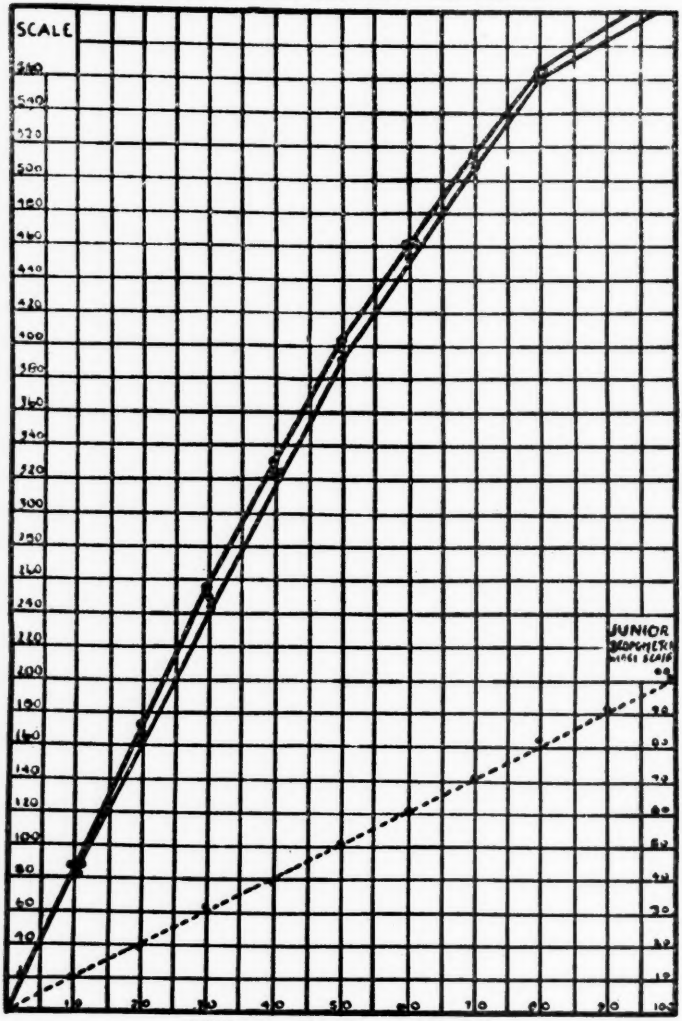
Hemoglobin Grams Per 100 cc

R. S. SPECIAL 1-2 5MM CUP STRIPED BEAM SPLITTER
D. C. NO FILTER SENSITIVITY ± 1 in 250,000

FIGURE 3

Hemoglobin Calibration. Note the unusual sensitivity.

ELECTRO SCOPOMETRY—Total Protein



Milligrams Protein per 100 C.C.
P.J. 22-12MM TEST TUBE STRIPED BEAM SPLITTER. D.C.
NO FILTER. ± 1 in 2 Millon

FIGURE 4

Fig. 4 shows the accuracy of the instrument in the hands of untrained technicians.

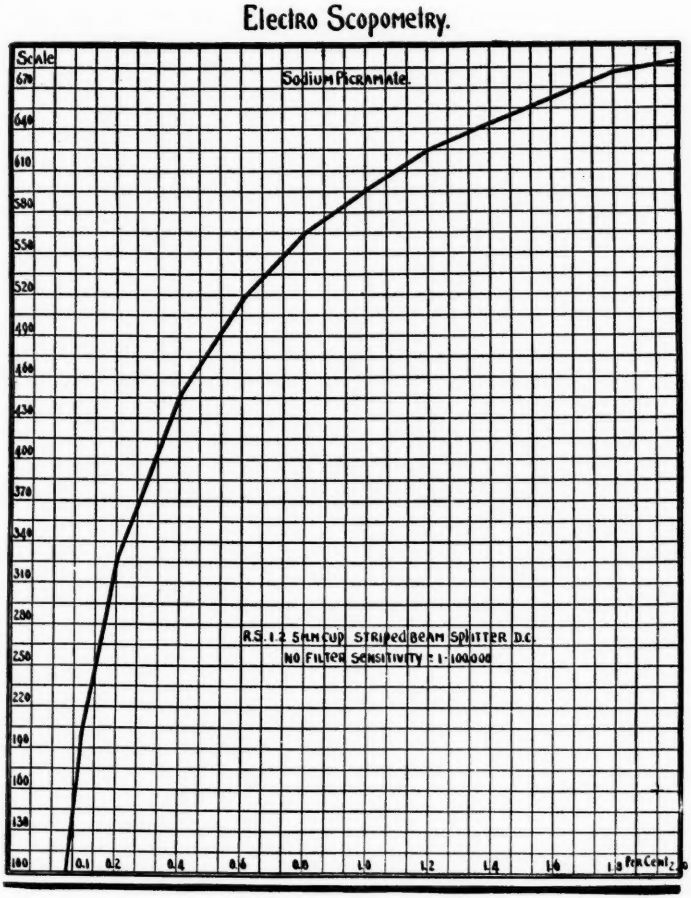
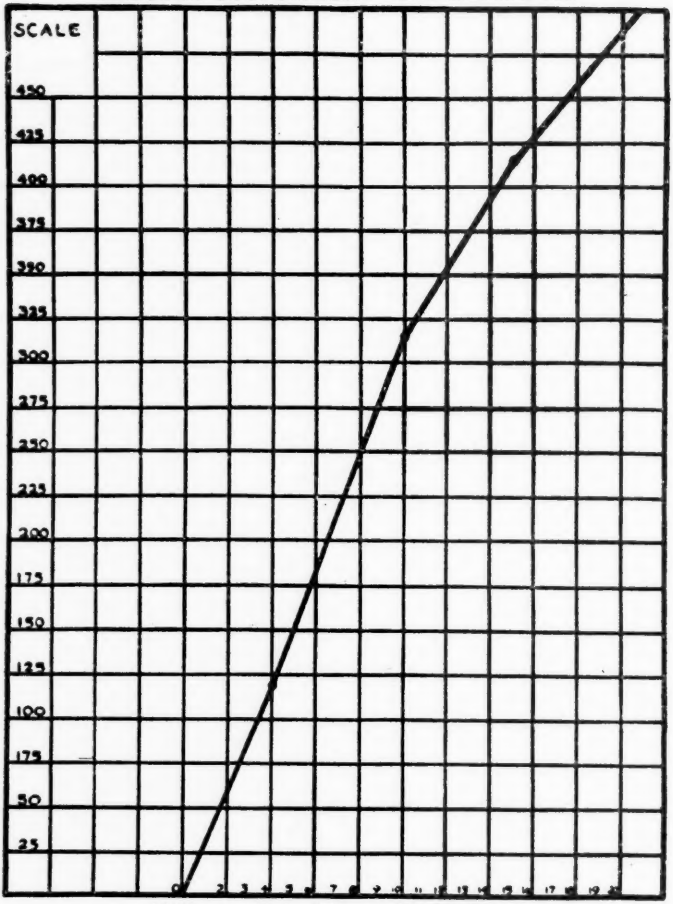


FIGURE 5

Showing the calibration for dinitro salicylic acid and picric acid reduction tests.

ELECTRO SCOPOMETRY—Uric Acid in Blood



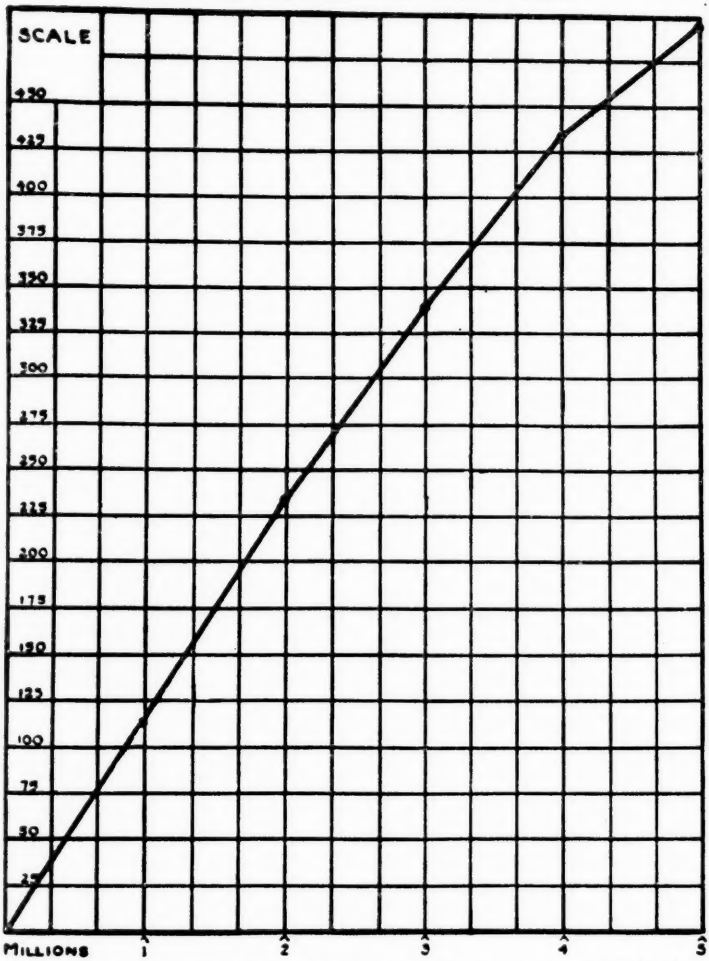
Milligrams Uric Acid per 100 CC Blood

P.J. 22-12mm test tube—Striped Beam Spliter—D.C. No Filter—± 1 in 10 Million. Results Similar to Folin—Wu. Blood Sugar and other methods depending on the reduction of Molybdic Oxide.

FIGURE 6

Calibration for the blue colors given by the molybidic reduction methods of Folin and Benedict showing the remarkable sensitivity.

ELECTRO SCOPOMETRY—Red Cell Count



Calibration Hemacytometer—(Average of four by two technicians)
P.J. 22-12mm Test Tube—Striped Beam Splitter—D.C. No Filter.
± 3000 Cells

FIGURE 7

Red cell counts by turbidity are much more sensitive than by hemacytometry under certain conditions.

A special caesium cell has, however, been made available which answers all the requirements of clinical colorimetry and turbidimetry. These cells have a number of advantages. They do not fatigue, they have sufficient sensitivity on the red side of the spectrum and they can be reproduced so closely that a calibration made with one instrument holds true for other instruments equipped with similar cells.

The hemoglobin (acid hematin) calibration given by these special cells is seen in Fig. 3.

The precision of the Electro-Scopometer in the hands of routine and untrained workers is indicated in Fig. 4. In this experiment a series of serum protein concentrations were precipitated with Exton's reagent and plotted against the Electro-Scopometer scale readings. Three individuals who had never seen the instrument were then given a few minutes instruction and the single readings they obtained also plotted on the graph. Fig. 5 shows the readings given by a series of concentrations of sodium picramate whose run of brownish red colors are similar to those of the dinitro salicylic and picric acid sugar reduction methods.

Fig. 6 shows the results of measuring blue solutions like the sugar, phenol, uric acid, and other molybdic reduction methods of Folin and Benedict. Fig. 7 shows the results of measuring suspensions of red blood cells.

All of the calibrations were made from single observations with an experimental instrument which is in routine use in the Prudential laboratory, and it is interesting to note that the accuracy of the instrument disclosed the necessity for refining bench manipulations which were hitherto routinely practiced. Its practical application has also shown that only those who have had an opportunity to use it can adequately appreciate the ease and rapidity of Electro-Scopometry.

In the development of an instrument like the Electro-Scopometer the help of others having technical knowledge and experience is indispensable, and I am therefore happy to acknowledge the cooperation of Messrs. Leeds and Northrup of Phila-

delphia and the scientific bureau of Messrs. Bausch and Lomb of Rochester, N. Y., especially the help of Mr. Allan Martin. To Dr. C. Deshler of the Edison Lamp Works in Harrison, N. J., I owe thanks for giving me the benefit of his skill and experience in lamp photometry. To Mr. Edward E. Hiler of the Irvington Varnish and Insulator Company I am under obligation for valuable advice concerning electric circuits, and likewise to Dr. Loyd Jones of the Research Laboratory of the Eastman Kodak Company for spectrophotometric data and advice concerning light filters. For his interest and helpfulness in securing satisfactory photo-electric cells I am under a particular debt of gratitude to Dr. H. C. Rentschler of the Westinghouse Research Laboratory, Bloomfield, N. J. For his constant encouragement and interest, his fine knowledge of chemistry and numerous valuable criticisms and suggestions I am especially grateful to my associate, Dr. Anton R. Rose.

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DR. MUHLBERG—The suggestion was offered last year by Dr. Folin and Dr. Blatherwick, that perhaps 50 grams of cane sugar might be used in sugar tolerance tests, rather than the 50 or 100 grams of glucose, to which many persons object.

We were all naturally very much interested in the subject, and are grateful to Dr. Blatherwick that he is submitting further evidence with reference to it.

BLOOD AND URINE SUGAR AFTER THE INGESTION OF 50 GRAMS OF CANE SUGAR PRECEDED BY A REGULAR MEAL

NORMAN R. BLATHERWICK, PH. D.

The Biochemical Laboratory of the Metropolitan Life Insurance Company.

Dr. Folin and I presented to you last year the results of our studies on the sugar of the blood and urine after the ingestion of 50 grams of glucose preceded by a regular meal. We concluded that such a system gives reliable information concerning the carbohydrate metabolism and that the smaller amount of sugar and the non-interference of the preceding meal offer decided advantages in life insurance work. Dr. Folin mentioned then that he had also tried the same amount of cane sugar in 8 cases and that he found this sugar gave fully as reliable results as glucose. He mentioned the advantages of cane sugar to be a lesser tendency to cause nausea and the fact that this sugar is readily obtained in a pure state. In the discussion of our paper, a number of the members commented favorably upon the possibility of substituting cane sugar for glucose in tolerance tests.

Because of the interest shown in this question, I have made an investigation of this problem using for Subjects the same individuals on whom the effects of glucose were determined last year. These people were laboratory workers, clerks and porters employed in our laboratories. Their ages varied from less than twenty to more than sixty years. Blood sugar was determined both this year and last by the ferricyanide method of Folin. The amounts of urine sugar, before and after inversion, were estimated by the method of Folin and Berglund. In the Table, I have recorded the values found last year with glucose and those obtained this year with cane sugar so that an easy comparison may be made. The results with glucose are presented

in ordinary type and those with cane sugar in heavy type. The values for urine sugar shown in parentheses represent the amounts found after inversion.

Our results show that in most cases the blood sugar curves after the taking of cane sugar are as good as with glucose. There is a tendency for the highest point to be somewhat lower than when glucose is used. However, we have found two notable exceptions in our comparatively small series. These two Subjects failed to show any significant increase in the blood sugar after the ingestion of cane sugar. One of these Subjects (C.H.) was studied again collecting the blood at shorter intervals to find whether the peak of the curve had been missed. The findings showed that there had been no increase of sugar in the blood. Repetition of the experiments with glucose revealed the expected increase in blood sugar. This latter result rules out the possibility that this Subject might absorb glucose so slowly as to be without effect on the blood sugar. The values for urine sugar in the case of C.H. give no evidence for the absorption and excretion of unchanged cane sugar. A probable explanation for this lack of effect on the blood sugar may be that this Subject inverts the cane sugar at such a slow rate as to be without effect. For convenient reference, the exceptional findings with Subjects C.H., S.S., and E.F., who also had a small increase in blood sugar, have been placed at the end of the Table.

The values for urine sugar show that in no case was there glycosuria. Many of our Subjects showed the glycuresis described by Benedict to follow the taking of glucose. In fact, it is possible that the glycuresis following the ingestion of cane sugar may be more common than in the case of glucose. At any rate we find it more often than did Dr. Folin in his series of last year. The values for urine sugar after inversion showed nothing unusual.

The fact that we have encountered 3 persons out of 27 who do not give satisfactory increases in blood sugar after the ingestion of 50 grams of cane sugar forces us to the inevitable conclusion that this amount of this sugar cannot be safely used

for tolerance tests. Were such flat curves encountered in our routine work, I believe that we would either question if the sugar had been retained or we would suspect that insulin had been taken. Glucose should continue to be used in the determination of carbohydrate tolerance.

It is a pleasure to acknowledge the technical assistance of the following in the investigations of last and this year: Misses Mary Ewing, Charlotte Gast, Anna Post, Susan Sawyer and Madeline Tschaler.

Sugar In Blood and Urine after the Ingestion of 50 Grams Sugar Preceded By A Regular Meal

Subject	Age	Sex	Wt.	Time after breakfast hours	Blood sugar-mg. per 100 cc.					Urine sugar-mg. per hour		
					Initial	30 min.	60 min.	90 min.	120 min.	Before Sugar	1 hr. after	2 hrs. after
N.R.B.	42	Male	178	1¾	100	145	118	101	98	*		
				2	99	137	111	103	93	26.2 (49.6)	37.8 (68.2)	24.4 (52.1)
A.A.	68	Male	156	4	94	154	109	122	88			
				3¾	87	144	111	79	82	35.2 (53.2)	20.1 (30.2)	13.1 (21.4)
F.G.	29	Male	127	2¼	98	145	149	143	114			
				2	110	151	141	101	112			
				2½	97	133	108	116	93	16.0	21.6	14.9
A.O'B.	35	Female	175	2½	99	183	140	91	91			
				2½	95	146	107	90	86	47.7	249.8	28.0
E.J.	26	Female	134	2	91	135	118	105	99			
				2	91	127	132	125	108	17.8	22.3	19.1
L.S.	27	Male	146	2¼	102	140	106	103	99			
				3	91	130	100	98	87	24.0	26.5	19.6
P.B.	29	Female	118	2	100	143	114	94	81			
				1¾	95	125	98	98	89	13.1 (19.6)	23.4 (28.5)	25.6 (32.9)
H.W.L.	30	Male	135	2	100	165	159	115	94			
				3	90	149	107	91	83	12.2	27.6	13.2
H.L.	25	Male	156	2	97	138	114	84	100			
				2¼	84	131	90	90	86	16.8 (31.7)	25.7 (44.7)	15.0 (63.6)
P.P.	28	Male	133	2½	99	148	119	79	101			
				2	91	150	113	80	84	30.8 (57.2)	33.7 (62.1)	21.4 (42.3)
C.M.	56	Male	185	3½	108	182	148	79	91			
				4	99	156	109	83	91	18.7	22.9	16.5
W.C.N.	44	Male	150	1½	115	163	123	116	105			
				2	95	160	120	89	95	21.4 (30.5)	39.5 (47.9)	18.0 (30.1)
D.B.	29	Female	155	1½	102	161	107	71	87			
				2¼	102	161	102	87	92	25.4 (44.6)	87.5 (97.7)	34.4 (52.2)
E.L.	29	Male	127	2½	101	157	154	133	89			
				2¼	86	140	129	88	82	19.9 (32.5)	43.9 (64.1)	25.0 (41.9)

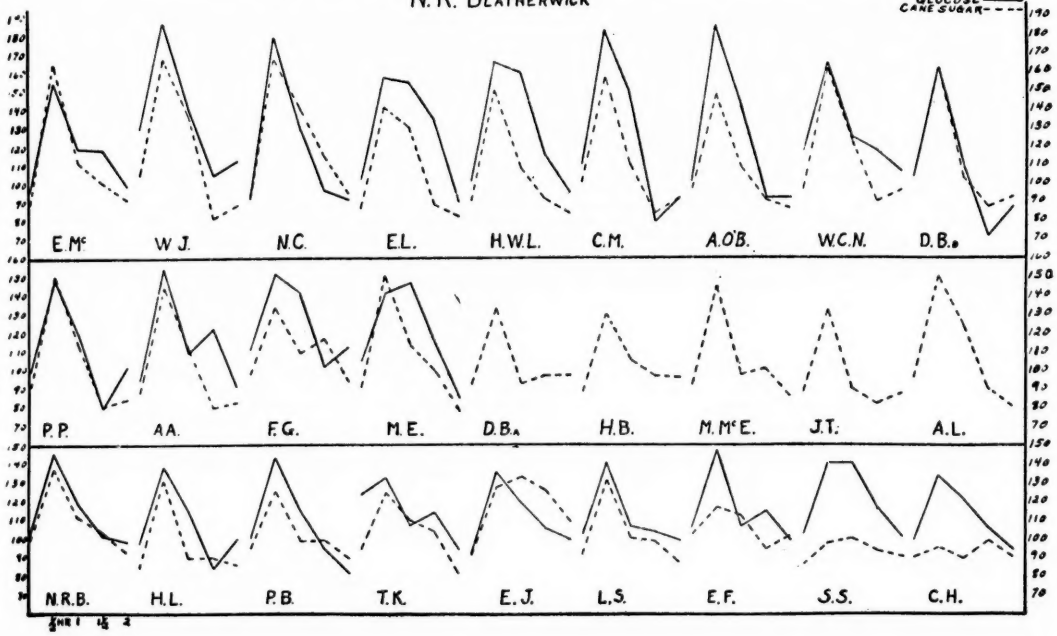
Sugar in Blood and Urine after the Ingestion of 50 Grams Sugar Preceded By a Regular Meal—(Continued)

Subject	Age	Sex	Wt.	Time after breakfast hours	Blood sugar-mg. per 100 cc.					Urine sugar-mg. per hour		
					Initial	30 min.	60 min.	90 min.	120 min.	Before Sugar	1 hr. after	2 hrs. after
M.E.	29	Female	102	1½	104	141	146	114	84			
				2¼	90	150	113	99	77	17.5	49.6	18.5
E.McC.	25	Female	110	3	96	154	119	118	99			
				3½	89	164	111	100	91	18.2	34.1	16.4
T.K.	21	Male	145	1½	123	132	107	113	94			
				1¾	94	124	109	103	81	28.3 (43.8)	29.6 (44.5)	29.6 (46.5)
W.J.	34	Male	167	2½	129	187	141	104	112			
				3¼	104	167	137	81	88	28.1	56.5	30.4
N.C.	42	Male	158	Fasting	91	179	130	96	91			
				Fasting	91	167	141	114	94	15.7	23.4	6.7
M.McE.	18	Female	105	2¾	91	144	97	100	85	14.9	56.0	20.5
H.B.	27	Female	132	2½	87	129	104	96	93	16.5	24.1	17.4
J.T.	19	Male	141	1¼	87	132	89	82	87	29.9	21.2	15.1
A.L.	31	Male	155	2½	95	149	123	90	80	33.5 (45.9)	34.2 (46.4)	19.0 (28.6)
D.B.	22	Male	160	2½	92	132	92	96	96	26.5 (35.2)	26.6 (35.3)	20.0 (29.2)
S.S.	27	Female	129	2½	102	140	140	116	101			
				1¾	86	97	99	93	90	22.7	44.7	31.0
C.H.	29	Male	144	2¾	98	133	120	105	94			
				1½	90	95	89	98	90	18.4	36.9	34.6
				2	105	105	102	103	107	22.6 (33.4)	28.2 (40.0)	22.0 (34.2)
				2	91	115	103	98	90	14.1 (18.6)	17.3 (24.9)	15.1 (24.1)
				2	94	119	95	91	81	12.1 (18.2)	13.8 (19.6)	13.8 (19.4)
E.F.	30	Female	125	2	105	147	106	114	99			
				2½	102	116	112	94	101	16.8 (27.9)	36.5 (44.4)	26.8 (36.7)

*Figures in parenthesis represent total sugar found after inversion. Ordinary type indicates glucose. Heavy type cane sugar.

Blood Sugar after Ingestion of Fifty Grams of Glucose or Cane Sugar

N. R. Blatherwick



DR. MUHLBERG—The tendency for finer differentiation in the selection of risks has been steadily gaining in impetus. The X-ray, cardio-vascular tests, electrocardiographs, blood sugar tests, are demonstrating their value and practicability in insurance selection.

For one of our largest groups, namely—albuminuria—we still rely solely on urinalysis. It would be a distinct step forward if through some special blood test, this large class could be split into smaller subdivisions. We are fortunate in having with us, one whose scientific attainments and thoroughly practical suggestions have in the past tremendously furthered our interests, and Dr. Folin's paper on "The Determination of Non-Protein Nitrogen in Blood and Its Relation to Nephritis" will no doubt blaze the way for new advances.

DR. FOLIN—Mr. President, may I say a word with regard to the interesting results that Dr. Blatherwick reported. It is, of course, a matter of interpretation as to whether these results show that cane sugar can not be used instead of glucose. I think the essential, and, in fact, the only important feature of sugar tests in connection with the possible finding of diabetics is that the blood sugar shall go down two hours after giving of the sugar, or two and a half hours. From that standpoint you will see that all of these curves of Dr. Blatherwick are perfectly satisfactory.

I realize, of course, that many of you think that the height to which the sugar rises is of consequence. I don't think so, but, of course, it is perfectly correct nevertheless for Dr. Blatherwick to bring out these results and so long as you want the sugar to rise before it falls and think that is important, then Dr. Blatherwick's results must also be given very serious consideration. I have talked with Dr. Blatherwick a little about it this morning and I see why he takes that point, and it is perfectly all right, but I still believe that a diabetic who has not received insulin will give results with cane sugar that will show whether he is a diabetic or not.

However, that is not what I stepped up here to talk about and no discussion was called for. What I rather wish to do this afternoon is to talk, as the Chairman has indicated, about another topic, and this time I have written a very brief manuscript on that subject. But before reading this—I am a poor reader anyhow—may I make just a few informal remarks?

It is now exactly twenty years within a few months, I think, since I first seriously entered the field of blood analysis and I have been in that field more or less continuously ever since. Our first papers on the subject were published in 1912 and our first analyses, extensive analyses, of albumin blood were published in 1913. In that paper we first established the normal level of non-protein nitrogen and urea in blood and thereafter made a survey of different types of clinical material, and I remember well the impression that those results have made because of the tremendous differences which we found between the hospital material and the normal materials which we had obtained in our own laboratories from students and assistants. In the latter we have taken nitrogen figures varying only between 22 and 26, whereas, for example, when we took the outside material—we happened first of all to take syphilitics—we found out of 663 only 13 which came down to the normal figures which we had obtained on persons which we had every reason to believe were normal.

Then we examined the insane because to include them in the whole would represent the average population, and there we found that only about 50 per cent. of them came down to the normal figures.

Then we took in the nephritics and there we found that in every single case the results obtained were entirely different from our normal values.

I have never forgotten that and it was my intention at that time to keep on making studies of the blood and accumulating data under different conditions, but unfortunately for reasons which it is not necessary to dwell upon here, our new methods, while they seemed very good in comparison with those we

used before—there had been something of the sort in Germany and a little something had been published before in this country —our methods seemed to be superior when we began to use those methods, but then as one goes on one takes things for granted. We ourselves saw that there was room for improvement and so, as a matter of fact, the trend of the investigations has taken a different turn and during by far the greater part of these twenty years we have been busy with improving the technique.

A second series of methods was published in 1916. Another system of analysis which has been used for the past ten years came out in 1919. In the meantime Benedict's original method for the blood sugar came in and that also became incorporated in systems of blood analysis, and so we have perhaps given a little too much time to the technique to have accumulated as much information that might otherwise have come. But on the whole, I believe that the loss has not been great because of that fact. So many others have entered into that kind of work.

And now, if you please, I shall read you a very short paper.

THE DETERMINATION OF NON-PROTEIN NITROGEN IN BLOOD AND ITS RELATION TO NEPHRITIS

By Otto Folin,

Prof. Biological Chemistry, Harvard Medical School.

The subject covered by the title of my paper is, I think, a very important one, but all that I have to say about it can be stated in a very few words. It is indeed little more than a suggestion, since I shall not go into the details of the actual method which I wish to recommend for the determination of the non-protein nitrogen.

During the past year I have been occupied with the development and study of blood analysis on the basis of a simple, new principle for the preparation of protein free blood extracts. I am convinced that this new form of analysis is greatly superior to the old, and that inside of five years the latter will have practically disappeared. But it is not my purpose to dwell on that point at this time. I wish rather to call to your attention that an important part of this new work has been the development of a series of micro methods for the determination of the nitrogenous products—micro methods which are just about as easy and simple to carry out as the blood sugar method which is now familiar to many of you. It was not by accident or chance that I came to develop these micro methods. I have thought for several years that chemical blood analysis must gradually come to assume a larger part in the examination of life insurance clients. But it has been clear that the great practical stumbling block preventing such a development has been the business risk involved in collecting 5 or 10 cc. of blood from the applicants. If it had not been for the fear of this risk, blood analysis in the home offices of life insurance companies would probably today be as common a procedure as it is in examinations at the out-patient departments of hospitals. It would seem inconceivable that the taking of a few

drops of blood for the micro method could lead to any damage suits, and I therefore hope that many will be willing to try it. This hope is based in part on the fairly rapid adoption and use of the micro method for determining the blood sugar. It was because of such ideas and hopes that Dr. Knight and myself conspired this summer to put into your hands reprints of the paper describing the new micro methods.

In that paper are given several methods including revised ones for sugar and a new one for uric acid, but the one method which I wish to call to your attention today is the method for the determination of the total non-protein nitrogen.

There can be no doubt, I think, that there are a great many more people walking the streets today with unsuspected kidney damage and high levels of non-protein nitrogen than there are diabetics. There are almost certainly more with high non-protein nitrogen than with high sugar right here among ourselves.

In the laboratory we have, heretofore, depended only on the casts and albumin in urine to reveal the condition of the kidneys, but there are many persons without casts or albumin in urine, in whom we can find by blood analysis that the kidneys have begun to fail in their work. I submit that since we can get important information about the condition of these persons by the chemical analysis of 0.2 cc. of finger blood, the subject might well be worth your attention. I am, of course, not arguing for any routine chemical analysis of the blood. But just as there are doubtful sugar cases, so there must be many somewhat uncertain kidney cases where the physical and urine examinations are at or near the border-land of acceptance; these border-land cases, as well as all elderly persons applying for large amounts of insurance, represent the material upon which me might well begin to make non-protein nitrogen determinations.

In modern hospital practice the condition of the kidneys is determined by various so-called renal efficiency tests, as well as by blood analysis. And of these tests, the so-called sulphonephthalein test is probably most frequently used in this country. I have never had occasion to examine critically any of these

tests, but all of them seem to require the personal presence for several hours of the individual to be tested, and it therefore seems rather doubtful whether these special examinations soon, or ever, can come into extensive use in examinations for life insurance. These tests are supposed to show the efficiency of the kidneys at the time of the examination, whereas the blood analysis reveals whether the kidneys have been removing to a normal extent the waste products of the daily metabolism.

It is recognized that the kidneys possess much surplus ability to remove the waste products, and on the basis of that undoubted fact it is generally believed that the kidneys can lose much of their excretory power and yet remove the waste products from the blood to a normal extent, practically just as completely as can the perfectly normal kidneys. But I am not so sure about the validity of such a conclusion. It is true that many persons with deteriorated kidneys get along quite as well as if their kidneys were perfect, but it is yet to be proved, I think, that such persons are carrying perfectly normal levels of waste products in the blood. I hope to have something more to say about this at some other time. But if it should be true that many abnormal or subnormal kidneys can do the work so well that we can not detect their inefficiency by means of blood analysis, then it becomes all the more important to show by blood analysis that the kidney damage is not so extensive as to be revealed by such an examination.

In examinations for life insurance, I take it that one is trying to find out not only the person's condition as then existing, but also to make a guess as to what his condition will be ten or fifteen years later, and it seems to me that extremely important information would be obtained in the course of a decade or two by cumulative records of the levels of waste products in the blood carried by persons well enough and sound enough to be accepted for life insurance. But quite aside from these more remote benefits, I believe that the acceptance, or the basis of the acceptance, of a great many applicants might well become dependent upon the results obtained by the blood nitrogen determination where

other factors have indicated the desirability of making such a determination.

The one problem which always arises in connection with any kind of a test which is to be used for trying to discover whether a person is or is not normal is how to define the normal. And one of the advantages of long and widely used methods is that there gradually develops a concensus of opinion as to the variations which can be safely accepted as being within the normal range. My new method for the determination of non-protein nitrogen, like any other new method, is necessarily without such a background. We have done considerable work on this problem and notwithstanding the advantage of background and experience in favor of the older methods, I believe that it is already easier to pick out the abnormal by the new method. The reason for this is that the normal level of non-protein nitrogen according to the new method is only about two-thirds as high as the levels obtained by the older method, and also seems to be subject to less wide fluctuations. In a paper which has just been published we report that for normal young persons (medical students) the highest non-protein nitrogen obtained was 21 milligram per cent. It is undoubtedly possible for persons with strictly normal kidneys to raise their level of non-protein nitrogen (as determined by this method) considerably above that level. It seemed best to concede in that paper that the blood nitrogen might be raised even up to 30 mg. per cent. by means of heavy protein consumption. I believe, however, that any person who is found to carry a non-protein nitrogen level as high as 25 mg. per cent. during the morning hours (8 to 12) no longer has normal kidneys, unless it can be shown that he had consumed an unreasonably heavy breakfast. Tentatively, I should therefore set the upper normal level at this figure, 25 mg. per cent., and should regard even 23 mg. per cent. as suspicious.

Dr. Cort—Mr. President and Fellows: It is indeed a very great privilege to hear Dr. Folin's paper on non-protein nitrogen determination and it is a suggested forecast of what might be hoped for

in the utilization of this test in our work. As I have listened to his paper for the first time, it appears to me that possibly there are three points that should be considered in our discussion: First, exactly what is non-protein nitrogen; secondly, what should constitute a normal level of non-protein nitrogen; thirdly, whether or no there are other tests that would serve our purpose, particularly in urinary findings, whether or no they occur before or later than the non-protein nitrogen exceeds the predetermined normal level.

We must appreciate that non-protein nitrogen includes all the nitrogenous substances remaining in the blood after the removal of proteins by precipitation.

Non-protein blood constituents are: Urea, Uric nitrogen acid, Uric acid, Creatinine, Creatin, Sodium chloride, Sugar, etc.

Under ordinary circumstances the following values might obtain in health under an ordinary diet:

N. P. N.	25-30	mgs. per 100 c.c. of blood
Urea Nitrogen	12-15	mgs. " " " " "
Creatinine	1- 2½	mgs. " " " " "
Creatin	5-10	mgs. " " " " "
Uric Acid	1- 3	mgs. " " " " "

Dr. Folin's method is a process in which N. P. N. is reduced to ammonia and estimated by Nessler's solution with a colorimeter. It is entirely a micro method utilizing the small quantities of blood, 2-5 c.c. being sufficient for all tests, .2 of a c.c. being entirely sufficient for the N. P. N. test alone. It involves the use of unlaked blood which at one step in the process requires great care and very careful watching. The procedure has much to recommend it inasmuch as small amounts of blood only are required which can be obtained from finger punctures. It should not be forgotten, however, that you are dealing with very small amounts of specimen and reagents and laboratory procedure should be very exact, that your values correspond with methods utilizing larger amounts and laked blood. When cor-

rectly and exactly performed, results are comparable to other established methods; only Dr. Folin warns us that readings average to a slight degree higher than with the micro method. In routine laboratory work or hospital clinics where sufficient blood specimen can be obtained, it has no particular advantage. When utilized on cases such as children or for insurance work it has much the advantage of convenience insofar as small amounts of blood suffice for the test and can be obtained from finger puncture rather than by an aseptic venous puncture.

It is assumed that the N. P. N. determination is a great aid in the diagnosis and prognosis of nephritis conditions. The results of blood analysis furnish data not approached by any estimation of urinary constituents. In chronic passive congestion of the kidney, however, little or no retention of nitrogenous waste products is obtained.

Consideration must also be given to such conditions as acute or interstitial nephritis in which one of the non-protein blood constituents is retained, namely, uric acid.

Kidney damage is usually first manifested functionally by retention of uric acid if interstitial nephritis can be excluded. Secondly, urea is retained and last and most seriously fatal there is creatin retention. All of the above constituents are included in the term of "N. P. N." A rise of 5 mgs. of creatin for each 100 c.c. of blood is said to warrant a hopeless prognosis. The quantity of these substances varies from hour to hour according to the intake and kind of food and yet through the permeability of the kidney and its adaptability, their concentration is kept at a fairly constant level. When the kidney is damaged, they tend to accumulate in the blood. Among the retained substances urea amounts to about ½; others are: uric acid and creatin. The concentration of any of these substances will depend upon the variables such as intake of nitrogenous food, activity of metabolism, and excretory ability of the kidneys.

The impracticability of fully controlling the diet, of accurately measuring the activity of the metabolism, and the remarkable

elastic reserve of the kidneys from an estimation of N. P. N. must be considered as of small value in measuring slight grades of kidney disability. In the more advanced grades where N. P. N. if sufficiently well marked, these estimations are the most helpful of any function tests.

For practical purposes it apparently makes little difference which is determined—the blood urea nitrogen or the N. P. N. The results seem to closely parallel under all circumstances. The estimation of the urea is, however, much simpler.

It must not be forgotten that each of the several tests for renal function covers only a limited range of kidney activity. It is a mistake to assume that any one test measures kidney function as a whole.

Mosenthal's work on the elimination of water and sodium chloride and the Pthaline test also serve to reveal the degree of functional ability of the kidney—whether the kidney lesion be acute or chronic. These two tests are more dependent upon the permeability of the kidney and not its functional ability to excrete. A slow appearance and a prolonged excretion of the dye signify only permeability and might well be within normal limits, yet the retention of nitrogenous waste products shown by an N. P. N. might signify a condition seriously grave. In cases of long standing in which the kidney is seriously impaired, the amount excreted is always definitely below normal standards. In such cases the result from a Pthaline test would parallel very closely a N. P. N. showing nitrogenous retention.

The co-efficient of Ambard is a better method of determining the ability of the kidney to excrete urea than a knowledge of the level of this constituent product in the blood. Kidney permeability and nitrogenous retention while in a general way express a rough degree of kidney impairment, yet are independent of each other when interpreted in terms of kidney damage.

In slight kidney impairments the urea concentration in the blood cannot be unreservedly relied upon due to the wide variation within normal limits which is probably due to external

causes. It appears a much safer and more satisfactory method to measure the kidney's ability to excrete urea by comparing the blood urea nitrogen with the rate of excretion in the urine. This is possible by Ambard's co-efficient.

We must realize that uric acid is a difficult substance to dissolve. It is often the most difficult to excrete of the N. P. N. constituents. Urea comes next and creatinine last. Expressed in other terms, creatinine is the easiest of the N. P. N. constituents to be excreted.

It must be concluded that the figures of blood chemistry are the more trustworthy.

In degenerative conditions of the kidney these blood constituents are markedly altered. Retention of the nitrogenous substances occurs in a definite "stair case" order. In an interstitial nephritis the beginning retention of uric acid will be expressed early. As the condition advances accumulation of creatinine may be represented in the upper limit of normal, or abnormal to a small degree; and as kidney function is interfered with there occurs retention of urea, so finally in uremic nephritis we have accumulations of uric acid, urea nitrogen, and creatinine. Findings of casts and albumin are often made but such findings give us no estimation of kidney function.

I have doubt if an N. P. N. estimation is required to show kidney damage alone. It is a test that indicates clearly functional damage when we weigh the results in the balance between kidney efficiency, diet, and protein destruction.

We must conclude that each of the tests—Mosenthal's, "Pthaline", and Ambard's formula—each has a significance apart from the other. The analysis of the blood offers perhaps the readiest method and the significance of its results has an advantage perhaps over all others. Such a test, however, with its wide range of normal limits would be applicable only to more advanced conditions of kidney damage that would not be considered suitable for insurance purposes at present. It must be recognized that the final co-efficient of N. P. N. retention expresses retention of

the various constituents which in turn do not parallel each other, uric acid being the less permeable, showing retention before the urea nitrogen or the creatinine departs from normal levels.

In interstitial nephritis a blood test might be of great use for underwriting purposes, uric acid being retained in an early state, but to be of any value we must exclude gouty conditions. Casts, albumin, and blood are a fairly constant urine finding in any condition of kidney damage. These findings are early, in fact would probably be found before any appreciable N. P. N. has exceeded the normal limit. They signify damaged kidney function which for insurance purposes might be considered sufficient. I cannot foresee that for underwriting purposes we are concerned in the functional ability of the kidney. Such function is so intimately connected with intake and metabolism, factors beyond our control, that damage alone existing is sufficient for our purposes. In the more advanced kidney conditions where prognosis is essential to our work as insurance underwriters, they, because of the degree of damage, are removed from our field. Such estimations are for the clinician. If we can foresee a time when damaged kidneys can be estimated and underwritten on some sub-standard basis, then blood estimations of nitrogenous retention might be utilized to indicate the extent of kidney function. There are many practical reasons why it would be difficult to use this test on a large wholesale scale that might be reviewed and a difficulty not to be overlooked would be the standardization of normal and abnormal values to express the degree of kidney damage.

I have greatly enjoyed reading the papers and being acquainted with the work of Dr. Exton. He is a technician and a physicist far beyond my ability to discuss what he has to offer. His instrument at the present time apparently appears practical. It might be very well utilized in our laboratories, especially to determine various degrees of turbidity or as a substitute for the human eye in comparing color reactions that are the indicators

of our tests. I think he has made a very valuable contribution and I can foresee a practical application of his instrument.

The work offered by Dr. Blatherwick I have had no means of checking, nor have we in our laboratory attempted to make any sugar determinations by utilizing cane sugar. The idea to me is very appealing. If we could utilize cane sugar in place of glucose, it would be a very much more palatable mixture for our applicants. Were the amounts used comparable with our 50 gram glucose mixture as employed at the present time, such amounts would be smaller and in many ways more palatable. I think Dr. Folin's criticism or rather suggestion is the most valuable one of all, that Dr. Blatherwick's results conform entirely with what might be expected from the glucose tolerance test if you are looking for an early fall of the curve rather than looking for peaks. Dr. Blatherwick's results show returns to normal levels within time limits that might be anticipated. His prompt and rapid rises to peaks at present considered abnormal introduces a factor not foreseen. Such rapid response and such excessively high peaks, however, are probably dependent upon more rapid assimilation of cane sugar than glucose. The velocity of absorption varies as to the kind of sugar employed. The tissue or the urinary filter seems to have a capacity of holding back some sugars. Glucose appears to leave the blood slowly probably because ordinarily the tissues are already supplied with it and none can escape in the urine because of the threshold. Levulose on the other hand when injected appears in large amounts in the urine. Large amounts also appear after eating fruits or candy. Time of conversion, assimilation, and retention are probably the factors that explain the difference in reaction between cane sugar and glucose.

After all, from what I know of blood sugar work, I entirely agree with Dr. Folin's opinion, that peaks do not give us any true sense of an individual's ability to handle heavy glucose loads. His ability to return to normal levels within a reasonable length of time is far more important than any other reading you can get from such tests.

The work begun by Dr. Blatherwick should be continued. It has features that recommend it and if we can standardize the time element and the height of curve to our present conception of normal reactions, perhaps we will discover that cane sugar is as suitable as glucose for our test. Further work should be urged by the companies fortunately having experimental laboratories.

PROFESSOR BENEDICT—These papers have been pretty thoroughly discussed and I shall add only a few words of comment in connection with them. The work of Dr. Exton I am thoroughly in sympathy with. I regard it as a very definite step forward. I think we all realize that the photo-electric cell should replace the eye in measuring difference in intensity of light, and Dr. Exton has apparently for the first time made that a practical propostion. Not only is the eye defective, but the brain back of it is subject to psychological influences, and if both of those sources of error are eliminated, as they are with the photo-electric cell, determination is placed on a totally different basis. I congratulate Dr. Exton on the wonderful progress he has made in the past year in this matter, and I think it is something in which both the insurance and university laboratories will have a very definite interest.

In connection with Dr. Blatherwick's paper and the point regarding use of cane sugar in place of glucose, I side with Dr. Blatherwick's interpretation rather than Dr. Cort's or Dr. Folin's. It seems to me in making the blood sugar test we want to be sure of one thing, and that is that we are giving enough sugar to put at least a moderate tax on the sugar-assimilating capacity of the individual. To my mind that is the value of the peak, not the height of the peak but that there is a sharp distinct peak and a distinct rapid sharp return to normal. If we cut out half of that picture, we have no proof that sugar entered the blood stream rapidly, that there was ever a definite tax even for a moment on the organism. One individual may have a

slower absorption, may have a slower inversion, and take the sugar molecules more slowly into the circulation and never have a peak and never have to return to normal and we may have missed something. Dr. Folin's point is well taken in a way, but I feel that until more work has been done, we should look for the peak as proof that the individual has been subjected to a little carbohydrate tax, so to speak, putting a little strain on the organism for at least a few moments.

In connection with the contribution of Dr. Folin on the question of non-protein nitrogen determination in the blood, I think there we have a step in the direction that may ultimately result in abandonment of urine analysis. Theoretically we are interested not in what the body has cast off, but what is in contact with the living tissues. We find that picture in the blood and correspondingly we should hope to make our ideal to have some day practically the whole picture told for us by blood examination. Just how rapidly that can come we do not know.

As to Dr. Cort's paper, the question still remains open as to how early non-protein nitrogen accumulation manifests itself in the blood, whether the kidney damage is first shown by an accumulation of non-protein nitrogen or first shown by the elimination of albumin and of casts in the urine. Conversely we have the situation of albumin in the urine not infrequently where the kidney damage never proceeds to any appreciable extent. I think we all know individuals who have had albumin in very appreciable amounts for fifteen or twenty years with no development of nephritis. In those cases through finding an appreciable amount of albumin with no increase in N. P. N. upon a subsequent examination, we might be able to avoid the injustice which is undoubtedly frequently done of eliminating such cases because of albumin in the urine when no development ever follows which involves any real retention. But at the present time we do not know how early the retention manifests itself in comparison with other means of detecting kidney damage cases will have to be carefully studied until the data are obtained.

I think that is all I have to say.

DR. ROBINSON—It seems to me that one of the primary aims of medical men in the insurance business is to increase methods of selection which are practical and at the same time accurate.

We are getting away from the art of selection where personal opinion is predominant and approaching the ideal of scientifically measuring the acceptability of risks. Our Association is most fortunate in having the valuable contributions of Dr. Exton, Dr. Folin and Dr. Blatherwick.

At our meeting last year, Professor Benedict impressed me by a warning he gave to the effect that new methods should be very slowly adopted in insurance work. He was discussing the use of fifty grams of glucose to replace the old standard of one hundred grams. Enough accurate data from original sources has now been presented to this Association to demonstrate beyond doubt that we can use fifty grams of glucose in our glycosuria cases. The results obtained by Dr. Blatherwick with fifty grams of cane sugar are disturbing. In the majority of cases curves are satisfactory to cane sugar; in others, not. We want the most practical method available in any test but we must be able to rely implicitly on the facts which are derived from this test.

I would like to outline briefly the method used in our Company with reference to blood sugar determinations. Since 1927 we have been calling for blood tolerance tests from the field. The great majority are received from large centers where we have Chief Examiners that are capable of securing specimens for us by venipuncture, using this tube specimens of blood and urine are obtained before administration of glucose. Specimens of blood and urine are obtained one hour and two hours after the administration of glucose. These three blood and urine specimens are forwarded to the Home Office where the determinations are made. We use fluorid of soda and thymol as a preservative and have adhered to the old Folin Wu method of using 2 ccs. of blood.

This method requires more of the applicant's time, but we have checked it sufficiently to know that the sugar content of

these specimens remains stationary for several days. I am hoping that very soon a method will be devised whereby we can safely preserve and transport quantities of blood on which the newer and more practical micro method may be used and the results be depended upon. The micro method on freshly collected blood is of course ideal but before using it on small amounts of blood which have to be transported, I would like to see some careful checks made on the keeping qualities of these smaller amounts.

With reference to the blood non-protein nitrogen determinations I feel that in certain cases the practical application of the methods outlined for us are going to be valuable. Whenever a person's N. P. N. is raised, however, he is an unsatisfactory risk for life insurance and in most cases has been for some time. This is true not only of the increase that occurs in nephritis but other conditions such as pyonephrosis and pyelonephritis, prostatic hypertrophy, etc.

In acute nephritis the N. P. N. may rise and then fall and the patient recover completely. The kidney heals by scar. We take this into account in our assessment of the risk's past illnesses.

During exacerbation of the sub-acute and sub-chronic stages a nephritis will have rises in the N. P. N. and it will fall again as he improves. In the chronic nephritic the N. P. N. will slowly rise after he attains some degree of fixation of specific gravity.

Now in all these conditions other clinical evidence is readily at hand to make the diagnosis and I feel that in the majority of cases the N. P. N. is superfluous where capable men are involved.

If we have on our list of examiners a man who does not take the applicant's history, who cannot take blood pressure or record an accurate specific gravity or percuss the heart outline, much less examine the eye grounds, then I believe an N. P. N. report from a thoroughly capable and reliable laboratory might be of warning value to us that something was wrong.

Dr. McCrudden—Mortality Experience: Glycosuria, but normal response to blood sugar test.

Between August, 1923, and April, 1930, the New England Mutual Life Insurance Company insured at standard rates 930 individuals who showed glycosuria either on examination or before examination, but who did not show more than 120 mgms. of blood sugar per 100 cc. blood two hours after ingestion of 100 grams of dextrose.

The total exposure of this group up to October, 1930, has been 2,999 years. There have been three deaths, which is 9% of the thirty-four deaths called for by the American Experience Table.

Two of the deaths were due to accident, one to pneumonia.

We feel that the findings warrant us in treating these "sugar cases" more liberally. Heretofore, we have offered these applicants insurance only on the Ordinary Life form and limited the amount on any one life to $50,000. From now on we propose raising the limit in the case of those applicants whose blood sugar is not higher than 120 mgms. under the test conditions to $100,000. We propose to offer $50,000 to such of them as show a blood sugar between 121 and 130 mgms.; and $25,000 to such as show between 131 and 140 mgms. We propose further to recommend Five Year Term policies convertible to such forms of Limited Payment life that the reserve at the end of twenty years will be equal to the reserve on Ordinary Life as of the original date of issue.

Dr. Exton—With regard to Dr. Blatherwick's curves it is of interest to recall that our original problem was to find out whether or no a suspected individual did or did not have diabetes. For that purpose we thought that cane sugar added to a regular meal would be a sufficiently rigorous test and for this purpose experience has shown it to be very practical and efficient. The advent of insulin, however, has altered the situation because we have now two problems instead of one. One of them is: Does the applicant have diabetes? and the other is: Is

the applicant taking insulin? Now cane sugar, of course, contains two different carbohydrates which are absorbed at different rates, and the results, of course, differ from those of pure glucose with its single absorption rate. I hope that Dr. Blatherwick will continue with this line of work and that he will take into consideration what the subjects have eaten before the test meal, which several studies indicate has much to do with the effects of the test meal. I have seen curves of glucose test meals which are as flat as those seen after the cane sugar test meals. Perhaps it would be more conclusive to give the test meals a week or so instead of a year apart.

With reference to the blood N. P. N., I wholly agree with Drs. Folin and Benedict that it would be very helpful if we could tell if a man's kidneys were diseased or not by some kind of simple blood examination. A great deal of fine work has been done on this very point by what may be called two different schools. One concerns itself with the way the kidneys happen to be functioning regardless of what may be the matter with them, while the other school tries to determine the extent of renal damage. Of course renal damage or structural change of the kidneys is one proposition and the way the kidneys happen to function over a certain definite period is quite another. I think it is pretty well agreed, however, by both schools that none of the tests now available, which, of course, includes the blood N. P. N., gives early enough information. People seem to be able to get along so well with some kinds of damaged kidneys that the N. P. N., like the functional tests, does not show even gross damage. During the past year some literature has come from Vienna and Chicago which claims that the blood indican, an entirely different proposition, gives earlier indications than our present tests of deranged kidney function and damage. If this proves to be the case, it should be very helpful in insurance medicine because there is practically no difficulty in preserving blood specimens for indican tests.

In a recent monograph (Medicine, Vol. IX, September, 1930) Van Slyke of the Rockefeller Institute and nine co-workers give the results of a very careful study extending over years of some 60 different cases of nephritis. I can commend this work to all of you as being well worth while reading. They say that the urea clearance, or c.c. of blood cleared of urea in a given time is the most delicate test. This test involves a blood urea and two urinary urea determinations and is not impracticable for insurance work. They also find the blood protein, a very simple test, of much prognostic value.

I cannot agree with those who think that urinalysis is going to lose in importance. On the contrary, I expect it to gain in importance when we do it better and learn how to use it better, but that does not mean that good correlative information from blood chemistry will not be very valuable. We need both.

May I add my hope that Drs. Folin and Benedict will both give some thought to the matter of preserving blood so that we can get specimens into our laboratories in good shape for tests rather than have to depend on Tom, Dick and Harry throughout the country for our results.

Dr. Blatherwick—The question of the exceptions with our cane sugar cases, the three at the bottom line, I think was brought out in the paper proper. My chief point there was that if in our actual work we encountered these approximately flat curves we would not know whether the applicant had actually retained the sugar, and another possibility is that the applicant might have had an injection of insulin a short time before the sugar was taken. These are the two practical points. In either case we would get a flat curve, just as we do with cane sugar.

The paper of Dr. Folin has interested me very much. As to the question of which is the more important, the retention of the non-protein nitrogen or some other kidney test which might be applied to the urine, I may say that we have some experimental work going on with rats in which we are producing nephritis and

our experience so far is that we get indications in the urine of kidney injury earlier than we do any increase in blood non-protein nitrogen.

PROF. FOLIN—Gentlemen, I think your meetings are improving here in that a great many capable men discussed these papers. Personally, I owe an apology to those who were called upon to discuss my paper, for I should have submitted a manuscript beforehand, but for various reasons did not do so, and it is, of course, very difficult to step right off and discuss a paper as it has been presented. Nevertheless, the matter presented by those colled upon to give a discussion was done very well.

I thought that perhaps you did not catch exactly the import of the little method that I have called to your attention. I recommended it as a supplementary test to be made where other tests seem to call for such an examination; also I recommended it because in simplicity and ease of execution it approaches very closely the blood sugar determinations which you have now already adopted for practical use. I shouldn't think of recommending that non-protein nitrogen determinations be adopted as a routine thing; also I shouldn't for a moment say that these other tests for renal functions or for these thorough examinations by physicians should be replaced by the N. P. N. determinations. It is just a simple additional method to be applied to cases where the other indications seem to call for it.

The only other thing that I should like to say is that I have adopted the non-protein nitrogen determination as being more practical. The uric acid I am not sure yet is the first substance to accumulate. As to indican, we have never bothered with it in this country and I have serious doubts as to whether it is important. Indican is produced in very small amounts, and without having tried it, I question whether it can be as useful as the non-protein nitrogen.

The point was raised by Dr. Cort that the nitrogen depends so much on the preceding diet. I pointed out that it is possible

to modify the level of the blood by diet, but in the papers which we have just published, we show that the figures are substantially the same on normal people, whether the blood is examined before breakfast or up to at least two hours after that meal. We chose that period particularly because it was the period at which one might call to make sugar determinations, and the practical conclusion which I came to is that during the forenoon hours in people that partake of breakfasts, which is not a very heavy meal, you will find that there are comparatively small variations and none exceeding very much the upper normal figure that I gave you, 21 milligrams per cent., and that when you get up above that figure by the new method—you will find under those conditions, I think, that the normal individuals with intact kidneys will not come much above what I put down as the upper normal permissible level, 25 milligrams per cent.

Dr. Muhlberg—This is the era of quantitative, as opposed to qualitative analysis. What has been done in improving our methods in the estimation of albumin and sugar ought reasonably suggest similar quantitative determinations for pus and blood. Dr. Clark has devoted several years of research to this problem and his studies are of the greatest significance.—Dr. Clark.

PYURIA

By Dr. Charles P. Clark

The term "pyuria" is employed to denote the presence of pus cells, or leukocytes, in the urine. We are in practice, however, accustomed to use the term to denote a definite increase in the number of pus cells, recognizing that in the urine of normal individuals a few of these cellular elements may be found. Hawkes states, "Pus corpuscles or leukocytes are present in extremely small numbers in normal urine. Any considerable increase in the number, however, ordinarily denotes a pathological condition, generally an acute or chronic inflammatory condition of some part of the urinary tract."

Webster recognizes that, "A few leukocytes may be observed in practically every specimen of urine, especially in those from women in which case they may be in large numbers and derived from the vagina. A marked increase, as recognized by numerous, indistinct, small, circular or irregular, granular cells, should be regarded as pathologic."

It appeared desirable, therefore, to determine the number of pus cells occurring in a series of specimens on the assumption that there is a number which represents fairly accurately the dividing point between normal and pathological pus cell content.

ESTIMATION OF AMOUNT OF PUS IN URINE

A study of the sediment after centrifugation gives us the evidence that pus cells are present. It is customary to report the amount of pus either on the qualitative basis using such terms as "a few pus cells," "A small amount of pus," etc., or by the average number of cells per low or high power field. A more accurate method is a modification of that used in the estimation of leukocytes in the blood or spinal fluid and a very simple apparatus is the Fuchs-Rosenthal counting chamber employed in the estimation of leukocytes in the spinal fluid,

basing the report in this instance on the number of pus cells per cubic centimeter of urine.

That the estimation of the amount of pus by the appearance of the centrifuged sediment placed on a slide and viewed with the microscope is far from accurate, is proven by the following study of a large number of specimens containing pus. By this method each of these specimens was reported to contain pus, the amount estimated by the appearance of the centrifuged sediment placed on a glass slide and viewed by low power. The nomenclature indicated the amount of pus present—"a few leukocytes", "numerous leukocytes", etc. After this estimation had been made a portion of the uncentrifuged specimen was then used for estimation with the Fuchs-Rosenthal chamber, and the result tabulated. It was found that actually Group I "a few leukocytes", included specimens showing less than 1,000 plus cells per cubic centimeter of urine, but other specimens reported in this group showed as many as 50,000 or more cells. The following table gives the lowest and highest count in each group.

TABLE I.

Estimated by Appearance of Sediment	Pus Cells per C. C. Urine (Determined by Counting Chamber) Lowest Count		Highest Count	Number of Specimens in Each Group
Few Leukocytes	1,000 minus	to	67,000	77
Numerous Leukocytes	2,000	to	214,000	94
Abundant Leukocytes	7,200	to	910,000	48
Small amount of pus	25,100	to	6,220,000	43
Moderate amount of pus	7,950,000			1
Large amount of pus	7,700,000			1

That the inaccuracy incurred in the employment of this method is experienced by other laboratories is demonstrated by a similar study made by Dr. Humphreys in the Health Laboratory of the Penn Mutual Life Insurance Company, of Philadelphia. The following synopsis gives the lowest and highest counts in each of five groups, the study covering the examination of specimens showing pus by one of the three methods mentioned.

TABLE II.

Estimated by Appearance of Sediment	Pus Cells per C. C. Urine (Determined by Counting Chamber) Lowest Count		Highest Count
Negative	1,875	to	43,750
Occasional Pus Cell	1,250	to	50,000
Small Amount of Pus	3,500	to	102,187
Moderate Amount of Pus	25,625	to	230,625
Large Amount of Pus	24,000	to	700,000

It will be noted that the term "a small amount of pus" was used by one laboratory in describing the pus present in a specimen containing as few as 3,500 cells per c.c. urine, whereas the second laboratory used the same term in describing the pus present in a specimen containing **6,220,000** pus cells per c.c. urine.

It is obvious, therefore, that the concentration of the pus cells estimated by appearance of sediment after centrifuging is a very unreliable indication as to the amount of pus actually suspended in the specimen.

A similar study was made by Dr. Humphreys of the Penn Mutual to determine the accuracy of the method of obtaining the average number of pus cells per standard field. A synopsis of his results is given in the following table.

TABLE III.

Average number of Pus Cells Per field	Pus Cells per C. C. Urine (Determined by Counting Chamber) Lowest Count	Highest Count
1–5	1,250	42,000
6–10	1,250	81,000
11–15	7,812	108,000
16–20	13,000	102,187
21–30	10,625	230,625
31–50	24,687	401,000
50+	85,000	700,000

This method also proves to be inadequate as a quantitative estimation of pus cell content. It will be noted, for instance, that the group showing from 1 to 5 cells per field included one specimen showing as high as 42,000 pus cells, and yet in each group from 6-10 to 31-50 there were included specimens showing less than that amount. Also, the group having fifty or more

cells included a specimen showing 85,000 pus cells per cubic centimeter, although every group except the first included specimens showing approximately that amount or considerably more cells.

It would appear, therefore, desirable if one wishes to deal with dependable reports, to use more exact methods than the two above mentioned; and inasmuch as the technique of the methods employed in the counting of leukocytes in blood and spinal fluid are so simple, it seems desirable to employ a modification of those methods. The only equipment necessary is a small pipette, ungraduated, and a Fuchs-Rosenthal counting chamber for spinal fluid analysis. This counting chamber is two tenths millimeters deep and the ruled space covers 16 square millimeters. The technique is as follows:

Shake the uncentrifuged urine and place a small drop on a Fuchs-Rosenthal Counting Chamber. Use cover slip. Count the pus cells in 16 square millimeters space. Divide the number obtained by 16 to ascertain the average per square millimeter. Multiply by five,* this giving the number in one cubic millimeter. Multiply by 1,000 and thus obtain the number of cells per cubic centimeters of urine.

The following formula may be used:

$$\text{1 cc. urine contains } \frac{R \times 5 \times 1000}{16} \text{ pus cells in which R}$$

equals the number of pus cells counted within the 16 sq. m.m. space.

We find for our purpose, however, that sufficiently accurate reports are obtained by counting the cells in 4 square millimeters and multiplying by 1,250, the result being the number of pus cells per cubic centimeter of urine. A careful counting thus made should be within 10% accuracy.

Our laboratory is expected to make an estimation by this method of every specimen in which the centrifuged sediment

*The Fuchs-Rosenthal counting chamber is .2m.m. deep and differs in that respect from others which are usually .1m.m. deep.

has indicated the presence of any pus cells. We find that less than 10% of the specimens which we receive require this additional count, which requires on the average less than five minutes per count.

INCIDENCE OF PUS IN THE URINE

In order to determine the incidence of pus in a group of supposedly normal specimens, we made a study by this method of 560 consecutive specimens. These specimens were sent to our Home Office laboratory in accordance with our usual rules. The following condensed table gives the result of this study.

Pus Cells per C. C. Urine	Number of Specimens	Percentage
Negative to 5,000	525	93.
6,000 to 10,000	20	3.5
11,000 to 50,000	12	2.
51,000 or more	9	1.5
Total	566	100.0%

Dr. Humphreys made a similar study of specimens received by the health laboratory of the Penn Mutual, but the type of cases with which he was dealing was different in two points. Undoubtedly a larger percentage of the specimens received by him came from policy-holders who had reason to believe that their specimens were not normal. Furthermore, a higher percentage of the specimens came from women, who tend, we believe, to show a greater incidence of pyuria. A study of 780 specimens received by his laboratory showed the following figures:

Pus Cells per C. C. Urine	Number of Specimens	Percentage
Negative to 5,000	430	55%
6,000 to 10,000	163	21%
11,000 to 50,000	142	18%
51,000 or more	45	6%
	780	100%

As a result of various studies, and particularly from experience in determining the insurability of applicants while utilizing reports based on exact figures with relation to pus content,

our rules have been greatly changed during the past six years. My original recommendation to the Medical Board, based upon our action with the older methods, was as follows:

"As to our underwriting policy, it might be safe to generally ignore, if the case is otherwise unimpaired, a report of 100,000 pus cells or fewer. Of 51 cases reported with amounts of pus in excess of 100,000 cells, 35, or 68% were actually declined because of the evidence derived from the specimen or from a study of the case. It would appear also in checking up the approved cases, that many of these bore evidence which would indicate that the applicant did have some irritation of the genito-urinary tract. Of the cases showing less than 100,000 pus cells per c.c. about 33% were declined, of which about 60% gave other evidence of some impairment in the genito-urinary tract."

It is our present rule to ignore a report of pus if 10,000 or fewer cells per c.c. urine are present, and if the case is otherwise satisfactory, but if more than that amount is present we write to the Examiner for an additional investigation and require two additional specimens to the Home Office. Information gained in some cases has been of great importance. I might cite as an illustration the experience with an applicant seventy years of age who wished to secure a million dollars insurance and who was examined at our Home Office. The first specimen contained 12,500 pus cells and an occasional red blood corpuscle but was otherwise satisfactory having a specific gravity of 1,019. We called for additional specimens. The second contained 56,250 pus cells and a very rare red blood corpuscle; the third contained 25,000 pus cells with an occasional red blood corpuscle and the fourth was entirely negative, other than the presence of 2,000 pus cells per cubic centimeter. This specimen, however, had a specific gravity of only 1,010. Although the applicant had gone to California, we requested an examination by a genito-urinary expert, a portion of the report being as follows:

"There is a large bead of glairy secretion at the meatus. Microscopically, this reveals a great amount of pus and many gram

negative rods and gram positive cocci. The prostate is not tender but is very large. The left lobe is especially large and extends far upward, almost beyond the region of the palpating finger. The diagnosis being benign adenoma of the prostate."

This case is interesting because of the great enlargement of the prostate gland with specimens showing so little evidence of pathology.

PYURIA AND ITS RELATION TO ALBUMINURIA

It is generally stated in the literature that the presence of pus in the urine is always accompanied by a positive test for albumin. Emerson in his Clinical Diagnosis refers to the work of Goldberg who stated that "for each 100,000 leukocytes per two cubic centimeters of urine, one may except 0.1% albumin". This apparently refers to an uncentrifuged urine. He further stated that, "The former idea, that the filtrate of the urine without true albuminuria is albumin free, is hardly true, although the amount of albumin in the filtrate is a very small amount."

We have received specimens containing many more than 100,000 pus cells per cubic centimeter in which the filtrated or centrifuged urine was entirely negative to the Sulphosalicylic Acid test. However, the Heat Acetic test gives a positive cloud in practically all specimens containing that amount of pus. A synopsis of a study of specimens with respect to the association of albumin (by the quantitative test) and pus is given in the following table.

Pus Cells per C. C. Urine	Total Cases	Number free from Albumin	Number containing Albumin	Per cent. showing Albumin
500 to 100,000	137	94	43	31.5
101,000 to 300,000	28	16	12	43.
301,000 to 8,000,000	20	0	20	100.

The technique which most of our companies use in the estimation of albumin is to first centrifuge the specimen and use the clear supernatant urine. The centrifuging will remove most, if not all, of the pus cells and, therefore, the albumin, if present, must represent either serum albumin or albumin derived from the purulent material. The second statement above quoted

from Emerson to the effect that the filtrated urine will contain albumin in small amounts only, unless blood serum is present, is well demonstrated by our own experience. A specimen which was received from an applicant 54 years of age indicated a previous history of prostatic disease. This specimen contained approximately 5,000,000 pus cells per c.c. urine and yet the amount of albumin present was only 10 milligrams. Of twenty cases showing over 300,000 pus cells per cubic centimeter, all contained albumin, but in nine of these the amount was only 10 milligrams, three contained 20 mg., and three others contained 30 mg. The highest amount of albumin in any specimen was 150 milligrams. This applicant showed hypertension, and the excess of albumin was probably due to a nephritis. It appears justifiable to assume that any amount of albumin over 10 milligrams may be considered in all probability an evidence of renal disturbance and in the majority of such cases, according to our experience, we will find a coincident history of hypertension, casts, pyelitis, and other evidence of involvement of the kidney.

SOURCE OF PUS

It is impossible for us in the Home Office to determine the source of pus from the report on the specimen alone. Our experience, however, has lead us to suspect that the kidney is involved if the amount of albumin is in excess of 10 milligrams and red blood cells are absent. We have been able to enumerate the pus cells in several cases of acute pyelitis and we have found that the amount of pus present during acute infection has usually exceeded 1,000,000 cells per cubic centimeter. The amount of albumin in all of the specimens examined has exceeded 10 milligrams. Th presence of kidney stone does not necessarily lead to a marked albuminuria. A recent applicant that we postponed, whose specimen showed the presence of 25,000 pus cells per cubic centimeter without albumin, has just been operated upon and a fairly large kidney stone was demonstrated by the surgeon.

Exceedingly large amounts of pus, according to statements of various authorities, are most frequently found in cases of acute

pyelitis, chronic cystitis and acute urethritis. As the condition subsides or becomes chronic, the amount of pus greatly decreases. In a case of chronic pyelitis which we have been able to follow, the amount of pus present usually varied from 100,000 to 200,000 pus cells per c.c.

The degree of pyuria does not give us a clue as to the seriousness of the pathology, for we all know that markedly enlarged prostate glands, cancer, renal stone, etc., may be unaccompanied by marked local infection, or irritation.

PYURIA WITH BACTERIURIA

It is, we believe, of great importance to note in the laboratory report the presence of bacteria, particularly of the colon type. Previous to this study we did not place much stress upon the presence of bacteria other than to assume that in the majority of specimens they indicated decomposition. It is, however, interesting to note the frequency with which bacilli of the colon type accompany pyuria. We are, for example, justified in suspecting renal infection in any case in which there is reported by our laboratory the presence of more than 10 milligrams albumin and more than 100,000 pus cells per cubic centimeter with bacteria but without erythrocytes. Although it is rarely possible for us to definitely make a diagnosis, yet I feel that it is of advantage to at least develop our suspicions in order that our investigation may be as thorough as possible.

CONCLUSIONS

It must be apparent that the older methods for the estimation of pus are inexact, and that it is worthwhile to consider adopting more exact methods for estimating the amount of pus. One may then determine, with confidence, the degree of pyuria present.

A very exact method of this type would be imperative if one is to properly assess the extra charge covering sub-standard cases, and I note a reference to the Canadian rules calling for an extra rating of 20 points or more where more than 10 cells per high

power field are found in a second specimen by two-glass test, standard insurance being given where the number of pus cells is fewer. May I again refer, apropos, to this statement, to table three, in which Dr. Humphreys found that when counted the group showing 6-10 per average standard field included cases showing as many as 81,000 pus cells per cubic centimeter.

Although one recognizes that the presence of pus cells, even in small quantities, may be suggestive of pathology, our own Medical Board, in the absence of any other evidence of disease, ignores a report of pus if 10,000 cells or fewer per cubic centimeter of urine are present and if the case is free from other impairments. About 96.5% of our specimens fall in this group. From past experience we now consider even 25,000 pus cells a definite evidence of pathology, although previous to the adoption of this method this amount would have been considered entirely negligible.

The amount of additional work placed upon the laboratory is trivial if only those specimens are thus further analyzed which show pus cells in the centrifuged specimen.

Dr. Carber—It is obvious to all Medical Underwriters that requests for such special methods of examination as Cystoscopy, Urethroscopy, Pyelography, X-ray, Blood Chemistry, etc., must be confined to an irreducible minimum of applicants for Life Insurance. Such applicants, especially if they have an inkling of the time, expense and physical discomfort involved, will not consult a specialist for the sole purpose of obtaining a policy. If exact diagnoses were required in all cases showing urinary impairments, a vast amount of good business would be lost, for most of them are not seriously impaired.

In recognition of this fact, for many years we have established arbitrary limits based upon quantitative findings of the pathologic elements in the urine, within which limits we have been willing to operate without further information. It is true that quantitative estimation of these elements is not a reliable method of establishing their clinical significance in the indi-

vidual case, since it does not fully take into consideration the location, nature, and extent of the underlying pathologic lesion, but is is also true that there are certain quantitative limits within which the vast majority of these cases will fall, among whom there are not enough individuals who are sufficiently impaired to materially affect the mortality of the group as a whole.

The accuracy of our selection on such a basis, which is necessarily more practical than scientific, must be dependent upon the accuracy of our own quantitative estimations at the time of examination and also upon the accuracy of the recorded observations of others. In the latter case, there are many factors of error unless uniform methods of observation are employed.

For many years the lack of reliable quantitative methods uniformly employed resulted in marked discrepancies in experience among the various companies, until about five years ago when Dr. Clark, in collaboration with Dr. Kingsbury, produced a simple and reliable method for the quantitative estimation of albumin, in which the principle of protein precipitation by sulphosalicylic acid was adapted to the needs of insurance medicine by means of permanent standards for comparison. Uniform use of this method has resulted in joint experience which will undoubtedly give most useful and dependable information.

In the case of glycosuria, considerable work has been done toward the same desirable end.

Now this Association is again indebted to Dr. Clark for a simple method of quantitative estimation of the formed elements of urinary sediment by adapting to our needs a clinical method which has heretofore been limited to the examination of spinal fluid. Today, he has presented the results of his observations with pyuria alone, but there seems to be no serious reason why this method cannot be applied to the quantitative estimation of blood cells and casts. Like pus cells, they may be first identified by routine examination of the centrifugal sediment, and it is not obviously apparent why they cannot be counted as readily as pus cells.

The work of Dr. Clark and Dr. Humphreys clearly demonstrates that our present methods of quantitative estimation of the formed elements in urinary sediment are wholly unreliable and the principal factors of error have been shown by previous papers read before this Association to be in the process of centrifuging. Uniformity in speed and length of time, as well as size and contour, of centrifugal tubes are all factors of error which are difficult to eliminate. Dr. Clark suggests the simple process of transferring a drop from a thoroughly shaken specimen to the counting chamber, counting four squares containing a total of ten or twenty cells and multiplying this total by 1,250, a method which presents no technical difficulties and appears to reduce the factors of error to a minimum.

Dr. Clark found that over 96% of all cases show a total of not more than 10,000 pus cells per cubic centimeter, and this number is disregarded by the Mutual Benefit in cases which are otherwise clean. Similarly, with regard to the frequency of albumin, we have found in the laboratory of the Mutual Life that about this same percentage of all cases of albuminuria show not more than .01% and we have been disregarding this amount in otherwise clean cases. No doubt, further experience of the Mutual Benefit will justify the acceptance of 10,000 pus cells per cubic centimeter as a limit within which it is safe to operate without further information, but if necessary, this limit may be changed to any point which experience dictates and final action will be expedited in a proportionate number of cases. Immediate final action on over 95% of any impaired group is indeed an ideal consummation.

The application of this method is still subject to modification in the light of coincident clinical findings. Bacteria, in addition to pus, in the urinary sediment makes the diagnosis of infection of the genito-urinary tract practically certain, but microscopic examination of a split specimen may localize the lesion distil to the bladder, or high albumin content or casts may suggest kidney damage. The presence of blood cells, in addition

to pus, would also suggest the advisability of further investigation.

It is hoped that it will some time be possible to establish the exact status of this method with regard to blood cells and casts, for Dr. Clark has made available to us a method of quantitative estimation of the formed elements of urinary sediment which is simple, accurate, easily applied, and which lends itself admirably to universal use. I feel that it merits the consideration of the members of this Assocation.

Dr. Chapman—Dr. Clark has certainly demonstrated the necessity for standardizing our reports on Pyuria. There has been undoubtedly a wide difference in methods employed in the various laboratories in estimating the number and amounts of pus cells, and it is essential to uniform selection that we all adopt the same procedure.

I have seen the Fuchs-Rosenthal Counting Chamber used and agree with Dr. Clark that it is an exact method, simple in operation and requiring but small additional work on the part of the laboratory technicians. Out of 566 specimens in the Mutual Benefit laboratories 3.5% showed pus cells of over 10,000 per C.C. It would, therefore, go to show that not more than 5% of all specimens coming into our laboratories would have to be put through the Fuchs-Rosenthal test, rather than the 10% that Dr. Clark suggests. Dr. Humphreys, who has collaborated with Dr. Clark in this work, is enthusiastic about the method.

If we are agreed that we can ignore a report of pus of 10,000 or less cells per c.c., I believe that this could only be made applicable to male specimens. Female specimens will normally show greater numbers of leukocytes, and unless we could have catheterized specimens it would seem to me necessary to raise our limits to 25,000 or even 50,000 leukocytes before we would be justified in asking for additional specimens. One well known urologist made the remark the other day that Life Insurance Companies should ask for catheterized specimens in every female case where the amount applied for is over $25,000.

Dr. Clark's experience with albumin in relation to Pyuria has been similar to ours at the Penn Mutual laboratories, in that the Sulphosalicylic acid test will often be negative or less than 10 mg. of albumin in the filtrated or centrifuged specimen, whereas the Heat Acetic Acid test will be positive. Obviously, this is due to the removal of the pus cells.

It has been our practice to report on our microscopic slips "albumin due to pus" when we believe that the pus alone has accounted for the albumin present. It would be difficult to prove that the border-line for pyuric albumin is 10 mg. and that amounts above that figure are due to some other source—serum albumin, etc. Nevertheless, I believe we are justified in endeavoring to make a differentiation between Pyuria and Nephritis by albumin estimation with the Sulphosalicylic Acid test. Todd calls it false albuminuria when due to pus, blood or vaginal discharge. When pus is present we must fall back on the examiner to try and ascertain the cause at the time he is collecting an additional specimen. He should be notified as to how much pus was found and to question the applicant as to the cause for it. Applicants themselves should be notified and given a chance to clear up a situation they may not know exists. I advocate the practice of obtaining a two-glass specimen as an aid to determine the source of Pyuria.

Eisendrath and Rolnick in their recent book divide the sources of Pyuria as follows:

1. Urehral and Paraurethral Sources:

   This requires search for evidences of persistence of infection originally due to the Gonococcus but superceded by the ordinary pus producing organism. Soft or hard (true strictures) infiltration of the Urethra, infection of the Urethral glands, Cowperitis, Prostatitis, Seminal Vesiculitis, Periurethral abscesses, etc. Common sources are Chronic Prostatitis, Vesiculitis or infiltration of the wall of the bulbous or membraneous portion of the Urethra.

2. Vesical Sources:

   Even after the seat of the Pyuria is located in the bladder search for stricture of the Urethra, obstructions at the vesical neck, Calculus, Neoplasm. Primary cystitis is infrequent.

3. Renal and Urethral Sources:

   Catheterized specimens required for
   a. Stricture of Ureter
   b. Calculi or Neoplasms
   c. Non-tuberculous infections
   d. Tuberculosis

Renal and Ureteral Calculi may not necessarily give rise to symptoms. About 15% of such Calculi do not yield a shadow on the Radiographic film. Renal tuberculosis offers a difficult problem as to diagnosis and localization.

Sixty-five per cent. of such cases present clinically under the picture of a Chronic cystitis, hence if a pyuria persists one should always suspect a possible Renal Tuberculosis. In about 10% of the cases of this disease a symptomless pyuria is an outstanding factor.

Dr. Clark—Dr. Muhlberg, in a preliminary letter to me, asked that I state my opinion concerning the value of the two-glass test from the standpoint of insurance underwriting. I realize that infection in the anterior urethra is usually a benign infection insofar as life is concerned and that the same is true of infections in the posterior urethra, though the latter because of their chronicity may lead to serious complications. Urethral infections as a class are undoubtedly more benign than those situated in the prostate, bladder and kidney.

We have not in our own Medical Department been accustomed to call for a two-glass test for the reason that we feel that all cases of pyuria where the amount of pus is considerable should

be treated on the assumption that infection, irritation, calculus or tumor may be present.

As an illustration of the hazard incurred in accepting applicants with urethral stricture, let me cite our experience with such a case. We issued $20,000 insurance on an applicant and according to rule a specimen was sent to the Home Office. We were not at that time enumerating pus cells according to our present method. Our laboratory, however, stated that the specimen contained "an abundance of leukocytes". Our rules at that time led us to approve the case without further question. This man died about six months later and we were informed that he died of an infection of the bladder and kidney which was secondary to a chronic stricture. One of the attending physicians told our inspector that the man had had this stricture for years and he had warned our applicant within a year that if he did not submit himself to treatment the stricture would cost him his life. I have the feeling that the applicant would probably not have been accepted today when we are depending upon the enumeration of pus cells. Furthermore, if we were to use the two-glass test in such a case, the second specimen would probably be free from pus, and yet this risk was a hazardous one.

We are all much of the same opinion in respect to the danger from focal infection and any focus of infection must be taken into consideration if we are to properly select our life risks. I do not, therefore, see how we can ignore a focus of infection which is located in the urethra with any assurance of its benignity. Treatment of such cases is often prolonged and accompanied by complications and absorption from such a focus must be continuous over a long period of time.

Dr. Chapman has stated that we must be more liberal in our interpretation of pus when the specimen has been voided by a female. Although I have not made a complete study of the subject, I must agree that pus is more frequently found in female specimens but the amount present is usually small. It is my impression that when more than 50,000 pus cells per cubic cen-

timeter are found we should require an additional investigation. It is wise to suggest that additional specimens be procured after a preliminary cleansing of the external genitalia.

DR. MUHLBERG—Gentlemen, this completes our program and business of this meeting of the Association, but before entertaining a motion for adjournment, I wish again to express my gratitude to the Metropolitan Life Insurance Company for their hospitality and to you gentlemen for your kindliness and your uniform courtesy and your patience with me as presiding officer and to our most efficient Secretary for his invaluable cooperation and counsel. Will somebody please move that we adjourn?

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THE ASSOCIATION OF LIFE INSURANCE MEDICAL DIRECTORS OF AMERICA

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